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ABSTRACT

These proceedings include 11 background papers that were presented by a panel of authorities in traffic safety and/or gerontology who were professionally concerned with older drivers and pedestrians. Papers focus on the needs and problems of older drivers and on what can and should be done to deal with them. Recommendations to improve safety for older--and all--drivers are provided first in three categories: driver, vehicle, and highway. The papers are "Vision of the Older Driver: Implications for Vehicle and Highway Design and for Driver Testing" (Merrill J. Allen), "Safer Cars for Seniors" (Roy C. Haeusler), "Licensing the Chronometrically Impaired Driver" (Newman W. Jackson), "Auto Insurance: Needs and Problems of Drivers 55 and Over" (Edward R. Klamm), "The Driving Situation and Drivers 55-Plus: Comments by a Long-Interested Retired Traffic Engineer" (Burton W. Marsh), "Training and Retraining the Older Driver" (Adele M. Milone), "Impressions: An Amateur Looks at Senior Drivers" (Clifford C. Nelson), "The Older Driver and Highway Design" (David Solomon), "Musculo-Skeletal System Impairment Related to Safety and Comfort of Drivers 55+" (John D. States), "Learning and Motivational Characteristics of Older People Pertaining to Traffic Safety" (Darlene J. Winter), and "Interaction of Older Drivers with Pedestrians in Traffic" (Sam Yaksich, Jr.). Other contents include results of a survey to assess mobility and safety of older drivers in a report entitled "A Survey of the Traffic Safety Needs and Problems of Drivers Age 55 and Over" (Darlene Yee) and editor's comments. (YLB)

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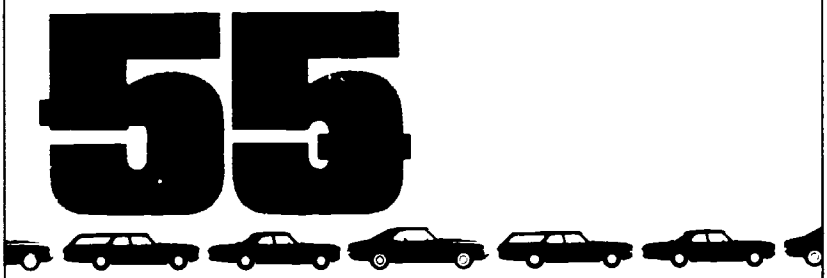

NEEDS AND PROBLEMS OF OLDER DRIVERS: SURVEY RESULTS AND RECOMMENDATIONS

PROCEEDINGS OF THE OLDER DRIVER COLLOQUIUM, ORLANDO, FLORIDA

February 4-7, 1985

James L. Malfetti, *Editor*

Foreword

Population trends show that the proportion of older drivers will continue to increase. Approximately 33 million drivers age 55 and over constitute 22 percent of all drivers today. By the year 2000 they will represent 28 percent of the driving population—39 percent by the year 2050.

"Being able to get around" is an important factor in the independence and good mental health of older people. Survey after survey reveals that driving their own cars is far and away the most preferred way to maintain transportation mobility. Just about everyone seriously concerned with traffic safety wants to keep older drivers on the highways as long as they can drive safely, and almost no one wants to take age as the sole indicator of driving ability.

In fact, drivers 55 years of age and over represent a wide range of ability. It follows therefore that no individual in that age group should have his/her license jeopardized solely because of age. However, there is convincing evidence that the skills necessary for safe driving begin to deteriorate at age 55 or thereabouts, perhaps dramatically so after 75. To help the aging driver cope with decreasing ability, there are driver-oriented programs which should be implemented, and design changes in automobiles and highways which should be made. The older-driver study (yielding these *Proceedings* among other products) was created to develop recommendations toward these ends.

A panel was formed of 14 authorities (see list of panel members) in traffic safety and/or gerontology who were professionally concerned with older drivers and pedestrians. Members included an orthopedic surgeon, optometrist, licensing examiner, insurance specialist, automobile design engineer, as well as driver trainers and educators, traffic and highway engineers, gerontologists and traffic safety specialists. Panel members prepared background papers in their respective areas, focusing on the needs and problems of older drivers, and on what can and should be done to deal with them. Over a one-year period, they shared with one another, with the aim of arriving at a consensus of recommendations and priorities.

During the same one-year period, panel members helped to create an in-depth, 128-item survey form which was administered to a representative sample of 500 drivers 55 and over throughout the United States. The results of the survey were analyzed and presented to panel members at a three-day colloquium. Discussions of background papers and survey results yielded recommendations for improving the safety of older drivers and, for the most part, all other highway users as well.

Recommendations, background papers, survey results and editor's comments constitute the *Proceedings*.

James L. Malfetti

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*Additional biographical information accompanies the paper prepared by each person, or appears elsewhere in the *Proceedings*.

Recommendations

The papers included in this volume were presented at the colloquium. Each presentation was followed by discussion. At the final session, papers and discussions were used by panel members as the basis for recommendations.

The colloquium produced many recommendations. Those reported here do not necessarily represent unanimity or suggest that every panel member supported all of them with equal enthusiasm. Rather, the recommendations represent consensus based in part on how panel members ranked them for relative importance. Therefore some particular favorites were screened out of this reporting. Most, however, can be found in the individual papers—required reading to understand the scope, rationale and full flavor of all recommendations made in the study.

While the focus of the colloquium was on the aging driver (55 and over), few, if any, of the recommendations would benefit older drivers alone; one way or another most would improve safety for all road users.

Recommendations were by agreement sorted into three categories—Driver, Vehicle, Highway.

Driver

1 State agencies responsible for licensing should require drivers of all ages with substandard driving records to take a corrective course and/or be reexamined for the operator's license. When such motorists are 55 years of age and over, they should be sent to educational courses designed especially for them. These courses should include information about the effects of normal aging on driving ability, and a discussion of ways to compensate for impairments. The importance of good general health—nutrition, exercise, stress management—to driving should be emphasized. So also should the effect of medication and alcohol on driving skills. Recent changes in driving laws and traffic signs should be studied along with the latest information on the value and proper use of seatbelts and other safety equipment. As a motivating device, violators who successfully complete the course should be eligible for a reduction of "points" or other detrimental entries on their driving records.

2 Educational courses in traffic safety should also be made available regularly to ALL older drivers on a voluntary basis. The sponsoring organizations should include those specializing in services to senior adults. Community colleges should offer driver education courses (basic, advanced, refresher) for the elderly.

Among the voluntary preventive measures gaining ever stronger support are the refresher courses for drivers 55 and over, with subject matter similar to that of the corrective courses taken involuntarily (as described in Recommendation #1). Volunteers who pass course requirements should be declared eligible for discounts in automobile insurance premiums under a state mandated plan or one originated by private insurance carriers.

For maximum impact, all courses, whether under public or private sponsorship, should be publicized widely and regularly. All media are urged to cooperate in this endeavor.

3 Physicians and pharmacists should continually warn drivers of the potential risks in driving after taking medication. Older persons consume medications in large numbers and amounts, and may be taking more than one simultaneously without knowing their separate or combined effect on driving skills. Survey results show that

a surprisingly large number of older drivers have inadequate or incorrect information on drugs.

4 All states should be in compliance with National Highway Traffic Safety Administration (NHTSA) standards for vision. There is substantial evidence that most of the information and the cues necessary for safe driving comes through the eyes, and that visual capacities decrease with age. Having set minimal optical standards for the operation of a motor vehicle, states should require all drivers to submit periodically to an optical examination, including the customary acuity tests as well as those for depth perception and peripheral vision. At the conclusion of the examination, the licensee should be informed of any corrective action deemed necessary to hold the license.

While panel members recognized that certain eye conditions (for example, cataract) are directly related to aging, they did not specify any one age for beginning mandated examinations–hence the consensus on NHTSA standards. However, panelists agreed that, at any age, licenses should not be issued or reissued until whatever unsatisfactory conditions revealed on examination are corrected for safe driving, as attested to by a qualified professional.

5 At least until the issue of passive restraints is resolved locally and nationally, drivers should be encouraged to take advantage of all occupant restraint and other "packaging" systems: i.e.; safety belts, airbags, head restraints, interiors free of hazards. Drivers 55 and over are more likely to be injured in automobile accidents because of the decreased strength of their musculo-skeletal systems, increased tightness of musculature and joints, and the limitations of arthritis. Safety belts are desirable because they are effective in rollovers and opposite side impacts, accidents in which airbags are not effective. Airbags provide better load distribution than safety belts, and reduce the risk of neck, chest and abdominal injury. The combination of airbags and safety belts provides the best available protection.

Manufacturers should publish and circulate current information on all safety features of their vehicles—including such items as seatbelts, which if improperly used can be hazardous. NHTSA should provide consumers with information on vehicular safety features (such as anti-lock braking systems) so that these can be considered in the purchase of an automobile and/or as supplementary equipment.

6 State driver manuals should be written and designed on the basis of the learning and motivational characteristics of older drivers. The "cartoon" format of some state manuals makes them more suitable for young drivers. Print size, color, contrast, length of sentences and paragraphs, reading levels, and complexity of general presentation are frequently unsuitable for older persons. This may result in an inadequate grasp of what is intended.

7 A road test should be the final criterion in the initial or continuing licensing of older drivers. Although written examinations, chronological age, and physical conditions can be considered as gross screening devices for issuing or denying a license, the final determination should include an adequate road test. Older drivers have been known to fail written examinations because of unfamiliarity with some test formats (complex multiple choice questions, for example) rather than lack of knowledge. Tests of vision, primarily because of the circumstances under which they are given, also can be misleading.

Vehicle

1. Automobile manufacturers should make a concerted effort to improve the design of seatbelts and other restraints and "packaging," and encourage their habitual use. Older drivers are more susceptible to injury than younger drivers and recover more slowly from it. In view of the positive role of restraints and other

passenger packaging equipment in the reduction of injuries, it must be noted emphatically that not enough older drivers are taking advantage of them. Surveys reveal that among the main reasons for this negligence are lack of comfort and difficulty of use.

More efficient and comfortable design is possible. Belts should be designed to be more easily reached, fastened and released. Lap and shoulder belts should be made available (for all cars, vans, light trucks) for every seating position in the vehicle. The inverted "V" or "Y" as an alternative design of shoulder belts would be an asset. So also would be an airbag and knee bolster for the driver, to supplement the lap and shoulder belt.

Manufacturers should provide older drivers with a written description of the inherent safety value of standard and optional equipment, and of how to use it properly. The written description should be supplemented by a demonstration and proper-usage check at the dealership before the car is driven off.

2. *Manufacturers should increase forward and lateral visibility by improved "A" pillar design.* "Blind spots" to the sides and rear of vehicles represent hazards even for young and skillful drivers. With age comes a decreasing ability to scan to the rear, or to turn one's head fully and quickly to try to see around "blind spots" before taking action. Making available larger interior mirrors (adjustable fore and aft) and exterior mirrors would also enable drivers to compensate for decreased head and neck mobility.

3. *Automobile manufacturers should design windshield wipers with a wider sweep to keep the side of the windshield clear.* These areas are critical to vision during turning movements, and older drivers suffer many of their accidents while turning and/or at intersections. Rear window defrosters, washers and wipers should also be made available for all cars. Heavily tinted ("black") glass should not be used (even for side or rear windows).

4. *Manufacturers should offer as optional the following safety features:* (While these would be of special help to older drivers in coping with the safety handicaps of normal aging, they would also be of assistance to the young).

4.1 *head restraints for every seating position;*

4.2 *a headlight washing and wiping system that operates whenever the windshield washer-wiper is turned on;*

4.3 *driving controls easily reachable by the properly positioned "first percentile driver;"*

4.4 *an anti-lock brake system for all cars and light trucks; and*

4.5 *power steering and power brakes for all cars.*

5. *Automobile manufacturers should design vehicle fronts and other exterior devices to minimize injury to a pedestrian in case of impact.* Hood ornaments and other protrusions at the front pose additional hazards for pedestrians, and should be avoided or minimized. Older pedestrians as well as older drivers are especially susceptible to injury and take longer than younger persons to recover from it. What might produce only injuries to younger people can be fatal to their elders.

6. *Automobile manufacturers in cooperation with traffic engineers should consider installing audible signal systems in vehicles to warn older drivers of a pedestrian in or approaching a crosswalk.* An inordinately large number of traffic accidents occur at intersections and crosswalks. One in three pedestrians killed is an older adult—the largest percentage for any group. Audible signals are now in operation at some intersections to help older and impaired people cross. Some traffic signals are automatically activated for motorists when pedestrians enter a crosswalk. The suggestion to install an audible signal in the car holds considerable safety potential for older pedestrians and drivers alike.

7 *Motorists should be encouraged to:*

7.1 *inspect their own cars routinely and to do minor maintenance within their own capabilities.* This has become increasingly important with the advent of "self-service" gas stations. Car breakdowns are no fun for anyone, but they can be especially hazardous to the health and safety of older persons. Automobile dealers and community colleges, among others, can give whatever brief instruction is needed by older drivers to facilitate inspection and maintenance of their cars.

7.2 *add to their present cars the high-mounted stop light that the National Highway Traffic Safety Administration has mandated for all future cars.* In general, the elderly drive more slowly and apply the brake pedal more frequently. The high-mounted stop light has proved its value in field tests, and can be of special value to older drivers in reducing rear-end accidents, to them and by them.

8. *While the foregoing recommendations on automobile design have for the most part been proved, additional exploration and research on the safety and comfort of the older driver are recommended.* It was interesting to note that some panel members not directly concerned with vehicle design thought at least a few of the recommendations "pie in the sky"—until, that is, they were presented with facts, figures and incidents of proof. And so with the *older driver as the focus*, we should try to determine such matters as: (1) how well automobile design accommodates vision and perception; (2) the most desirable type and location of mirrors; (3) the best shape and color for front and rear windshields; (4) the most satisfactory kind, size, and placement of headlights, and the potential contribution of polarized headlights; (5) the most suitable design and color to increase readability of dashboard gauges and dials; and (6) the best method to accommodate the physical limitations of aging—namely, reduced strength and decreased flexibility and comfort in relation to steering, braking, seeing to the side and rear, sitting, climbing in and out, adjusting the seatbelt and so on. Applied findings might well contribute to the safety and comfort of all of us.

Highway

(Recommendations 1 and 5 are directed to Congress, state legislatures, federal and state highway agencies, motorists, lobby groups and professional safety organizations.)

1. *When arterial highways are constructed on new rights-of-way, every effort should be made to provide full control of access. In addition, principal arterial highways connecting to the Interstate System should be upgraded to full control of access where feasible.* Studies have shown that the 43,000-mile Interstate Highway System with full control of access (i.e., no access allowed from abutting property owners, all crossroads grade-separated with long speed-change lanes at interchanges, opposing directions of traffic separated by a wide medium with barriers where required) results in a savings of about 6,000 lives each year when compared to conventional highways. Full-control-of-access highways are of great value to older drivers, who have extraordinary difficulty with turns and intersections on conventional highways. Highways with full control of access are a classic illustration of increasing the safety of all drivers by eliminating hazards from the traffic environment.

2. *In the design of highways, every effort should be made to minimalize the chance of accidents, and to reduce the severity of those that occur.* These safer highways should include easy grades, lanes 12-feet wide, wide shoulders, non-obstructed roadsides without nearby trees, wide and flat ditches, flat-sided slopes, impact attenuators at structures, and guard rails where needed. The objective would be to insure that highways would more safely accommodate not merely the average driver, but rather

a high percentile of **all** drivers, including the elderly. Almost everyone commits driving errors occasionally, and such roadways and roadsides would "forgive" some of these lapses and give the driver a second chance.

3 *On highways that are lighted, levels of illumination should be increased by a factor of at least FOUR to meet the needs of older drivers.* Generally speaking, the stronger the illumination the fewer the number of accidents. Because the visual faculties of older drivers can worsen with age, this is an area of special concern to them. State and local highway agencies, electric power companies and equipment manufacturers, are necessary partners in implementing this recommendation.

4. *Procedures should be developed by state and local highway agencies for periodic maintenance inspections of highways and traffic control devices. Inspections should be made both day and night, by staff* not *familiar with the area, and attention should be given to operational problems, including difficulties experienced by drivers—especially older drivers—using the highway. For the benefit of older drivers in particular, traffic control devices should be maintained at a high functional level.* Because of vandalism, weather, and normal wear and tear, such devices as signs, pavement markings, delineators, traffic signals and roadside hardware (e.g., railings) may be destroyed or damaged.

5. *A test and evaluation of an Electronic Route Guidance System (ERGS) should be made in an entire urban area or in a large part thereof.* It is virtually impossible on highspeed, high-volume freeways to provide adequate route guidance information for all drivers—particularly older ones—with signs alone. A technique developed in this country 15 years ago by the Federal Highway Administration, and now deployed in Tokyo and West Germany, provides customized route guidance information by means of a black box in the vehicle, into which is dialed the destination of the driver. A transponder and a roadside minicomputer then give the driver proper routing information.

6. *There are also numerous small-scale improvements in highway and traffic engineering that state and local highway agencies should make to assist older drivers.*

6.1 *Traffic signs and signals should be made as large, graphic, simple, and clear as possible.*

6.2 *Colors of traffic controls should be selected with recognition of the difficulty older people experience with certain colors, such as those in the red family.*

6.3 *Advance warning and informational signing should be used more extensively to minimize the number of visual and perceptual cues that older drivers must watch for in order to make safe driving decisions.*

6.4 *More readily visible delineations, markings, and other communications should be placed at pedestrian crossings with heavy vehicular and pedestrian traffic.*

6.5 *Traffic signals at intersections should be placed with the aim of reducing left turning problems, thus enabling drivers more easily to monitor the opposing traffic, to see pedestrians in crosswalks as well as the signal itself, and reducing the need for the wide-ranging eye movements usually required of drivers.*

6.6 *Unnecessary highway furniture, signs or plantings which interfere with a clear view of the intersection should be eliminated so that pedestrians and drivers are more visible to each other.*

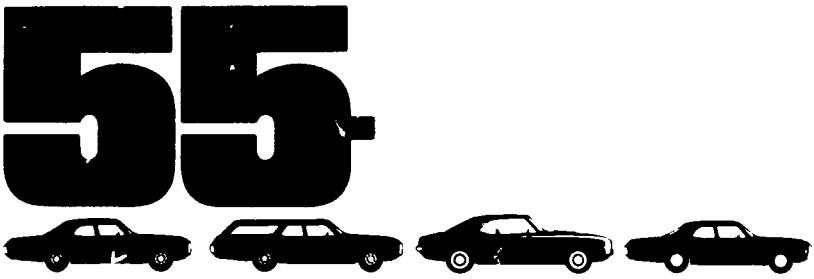
General Statement

The recommendations made above and others found in the separate background papers were offered in the hope of finding greater safety and comfort for drivers 55 years of age and over, and indeed for all road users. But the data bases out of which they grew are sometimes modest, sometimes inadequate. Current standards for highways, traffic laws, traffic control devices, driver licensing, traffic engineering,

driver training and information programs—all must be reexamined in a systematic way to take appropriate account of the needs and capabilities of drivers 55 and over. Thus there is a need for more and deeper research into the driving performance of the elderly, and into the conditions that influence it. Accelerated support, both public and private, is needed in this vast and demanding effort.

A research base and a broad dissemination of findings is critical, for there should be no discriminatory requirements, legislated or otherwise, for senior drivers without a record based on verifiable collective experience; nor should there be, in the name of economy or through allegedly "insufficient experience," excessive postponement of corrective action long known to be due. When the facts are in they should be acted upon.

But action should be based on consensus growing out of a system of continuous research *and* dialogue among public and private organizations concerned with and knowledgeable about older adults and motor vehicular transportation. Above all there should be planned input from senior drivers themselves, who, when adequately informed, will probably turn out to be as good a source as any for solutions to their own problems.



VISION OF THE OLDER DRIVER: Implications for Vehicle and Highway Design and for Driver Testing

Merrill J. Allen, O.D., is professor of Optometry at the School of Optometry, Indiana University and holds the B.Sc.Opt., M.Sc. and Ph.D. degrees (1941-49) from the Ohio State University. He has over 40 publications on motorists' vision and the visual factors of the automobile and highway, including a book, *Vision and Highway Safety* prefaced by Ralph Nader. He has served as a consultant to attorneys and industry, and to the U.S. Army and the U.S. General Services Administration. His goals include saving lives through accident reduction by proper visual design of vehicles and the visual driving environment, taking realistic account of driver limitations.

The older population apparently has an increasing rate of fatal motor vehicle accidents with advancing age (see Figure 1) beginning about age 60. Between ages 25 and 60 the driving success shows steady improvement. While a number of things are going on in the population which reflect in these data (including a greater fragility with age), the gradual deterioration in vision (see Figure 2) throughout the life of the average human seems unimportant as a factor influencing the shape of the curve up to 50 years of age. However, above 50 the visual deterioration begins to be significant and probably is a factor in older-driver accidents. Even so, in spite of the lower rate of recovery of older people from injury, and the marginally convincing evidence of over involvement in accidents, the older driver seems to compensate very well for his infirmities.

Older Driver Visual Characteristics

Driver license tests routinely concentrate on visual acuity. Most of the population demonstrate the ability to read 20/20 with proper glasses even to age 70. Figure 2 shows that at 100% contrast 80-year-old humans can read 20/40 or better. Since acuity testing is done with high contrast letters, the license bureau cannot detect the losses in visual performance occurring throughout most of a person's lifetime.

Visual acuity testing is a sensitive detector of the need for glasses to correct a handicapping focusing error such as nearsightedness, farsightedness or astigmatism. These errors of refraction are not necessarily associated with aging and, when present in a younger person can mimic some of the visual problems found among the older population. Thus, a younger driver needing but not wearing glasses may perform worse than an older driver properly corrected with glasses, contact lenses or a lens implant following cataract surgery. The reduced performance from poor vision shows

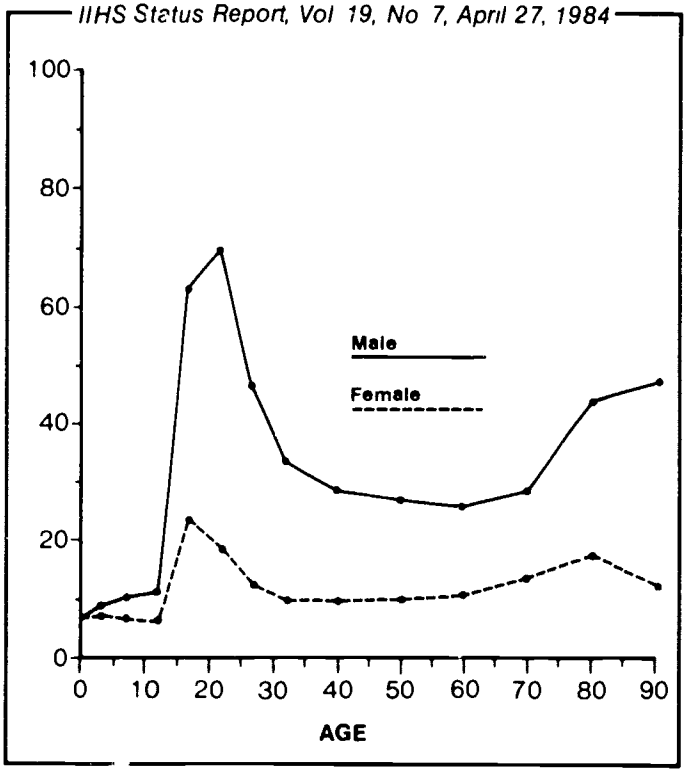


Figure 1
Deaths per 100,000 Population from Motor Vehicle Traffic Crashes by Age and Sex, 1977-79

up as a slowed response to signals, signs and the traffic events that might lead to an accident; just as ill health, age, drugs, alcohol, fatigue, distractions, environmental factors of rain, fog, darkness, solar glare, and so on are describable in terms of the slowed response time they induce. To help compensate for such adverse factors in traffic, the designers of the highway-vehicle systems need to design for a longer response time than the 2.5 seconds design time recommended by the American Association of State Highway Officials; or they need to provide improved vehicle, highway and signal systems that compensate for the degrading factors. Current deficits in design are themselves responsible for the 2.5 second response time recommended by AASHTO.

Aside from problems of focus, losses in visual performance in the elderly are due to losses of light intensity in the eye. The light forming the image in the eye must pass through the pupil, which typically reduces in area with age. A 6mm diameter pupil in youth can reduce to a 2mm diameter pupil in old age, a reduction 1/9 the area and thus 1/9 of the light available at the retina. In addition, the lens in the eye typically browns with age, behaving like a sunglass and absorbing much of the light that passes through the pupil. The combined losses of available light in the eyes of many older people can easily be equivalent to reducing street and automobile lighting to 10% (or less) of their normal design levels — as if drivers were wearing a very dark pair of sun glasses for night-time driving. This fact alone helps explain why many older persons will not drive at night.

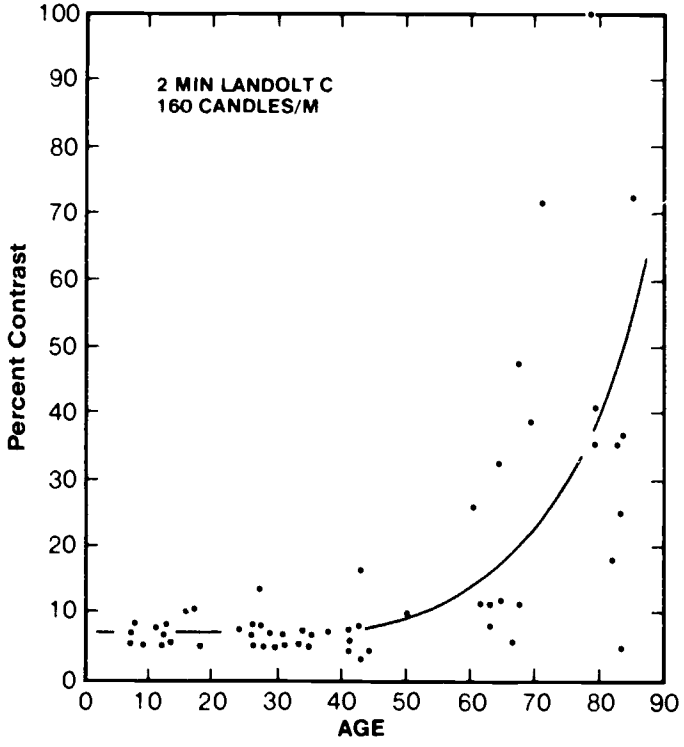


Figure 2.
A two minute Landolt C measures 20/40 visual acuity 160 candles per square meter is about the light level of an eye professional's projected test chart. All of these subjects were given a proper correction at the time they were tested.

Other problems frequently found in the older population include cataract, glaucoma, senile macular degeneration and diabetes.

A *cataract* is a detrimental change in lens transmission with age, a change which scatters and absorbs light in proportion to its severity. It reduces the contrast in the retinal image so that low-contrast objects may not be seen. Oncoming headlights become excessively glaring, and make night-time driving difficult or impossible. Early cataract changes also are usually associated with major changes in the strength of glasses needed, and if these changes are not corrected they can cause profound adverse effect upon visual performance. The person with cataract may pass a vision test for licensure yet restrict himself to daytime driving because of the difficulties of trying to drive at night.

The treatment for cataract is surgery and spectacles, contact lenses or a plastic lens implanted inside the eye. The surgery removes the cataractous lens from the eye. Then the focusing power of the missing human lens must be provided artificially. If thick glasses are used the distortions are severe and contribute to confusion and the slowed, insecure driving and walking behavior often observed among the elderly. Contact lenses are a more acceptable optical correction after cataract surgery, but the delicate handling and constant attention that they need makes them unsuited for many older persons. The ideal optical correction is to implant a lens in the eye following surgery. Often the implanted lens can give visual performance equivalent to

that of a much younger person and in some lucky cases, without any glasses. Improved surgical techniques have reduced the complications of lens implants to about the level of old-fashioned cataract surgery before implants. While there is still some danger of poor surgical result, the usual outcome of lens implants is very good. The visual performance should be good in all respects, provided no other complicating condition exists.

The cataract problem is but an acceleration of the visual deterioration shown in Figure 2. Of the several post-surgical corrections possible, thick spectacles are the least desirable because of spatial distortions (20% or more magnification with a significant blind zone around the edges of the lenses). Post-surgical cataract patients wearing thick glasses should be given a driving test to determine how well they have adapted to their spectacles. Once adapted to their correction, they should have good vision for driving except for the blind zone at the edges of the lenses.

The other conditions, however, may not be so dramatically treatable. For example, *glaucoma* is a gradual loss of visual function beginning in the periphery. It is usually attributed to increased intraocular pressure; hence, the standard treatment is to prescribe drugs to lower the pressure, and when these fail to perform surgery and, usually, continue the pressure-lowering drugs. In addition to the losses of vision caused by glaucoma itself, some of the treatment drugs cause cataracts, reduce the size of the pupil, and reduce the sensitivity of the retina. Each of these adverse drug effects is harmful to driving. Vitamin C in large doses may sometimes be beneficial in this condition with the adverse side effects.

Although the night-time driving performance of a candidate for licensure may be inferior, the driving examiner may not be able to detect a vision problem with the acuity screening test. Moreover, the peripheral vision test may not indicate any problem, even though the patient is using eye drops and has some losses of peripheral vision. The candidate should be asked specifically about glaucoma and eye drops and be given a night-driving test if indicated. Fortunately, the older driver who cannot see well at night will usually avoid night driving. However, a driver with glaucoma and/or side vision losses may, in fact, not realize that he has a dangerous loss of peripheral vision, a severe disadvantage even in the daytime.

"Senile *macular degeneration* is a loss of vision in the important central (macular) vision area due to neurological damage. Vision may deteriorate to 20/400 or worse. Peripheral vision may be normal, and the victim may move about as if normally sighted yet not be able to pass a driver's test. This condition is not characteristic of senility and — at present is not understood. Some hope for understanding comes from the recent discovery that cats deficient in the amino acid taurine develop a lesion resembling human senile macular degeneration. Foods containing taurine, such as fish, will prevent the disease in cats.

Diabetes causes a complex of visual problems which are harmful to driving. It may cause hourly changes in refractive error, which can be handicapping, especially for night driving. Diabetes is the single most important cause of cataract for people under 35 years of age. Diabetic retinopathy is a severe problem caused by abnormal blood vessels and capillaries in the eye. Fluctuations in performance, sometimes including catastrophic loss of vision, are complications of uncontrolled diabetes. The driving examiner should ask about diabetes, should perform all vision tests required and run a driving test on any questionable candidates.

Other problems in aging such as slowed reaction time, limitations to mobility of body and head, and the use of medications are generally similar to poor vision in their effects upon driving performance. A driving test or simulated driving test is highly desirable for questionable candidates for relicensure.

Design of Vehicles and Roadways

So far we have addressed the driver's characteristics. With these in mind, let us look at vehicle and roadway design. Since our population will contain more and more older drivers, it's time we realized that our current standards may not be adequate for them.

It is well known that: a) the more light, the fewer the accidents at night, b) the older the driver the smaller his pupils, c) and the older the driver the greater the absorption and scatter of the light entering the eye. Research has established that to maintain a given visual performance on a task, the illumination needs to be doubled for each 13 years increase in age. Thus the illumination adequate for a 40-year-old engineer to drive safely on the highway he helped design needs to be increased by a factor of 4 for him to perform equally well at age 66. Similarly the headlight power needs to be increased by a factor of 4. In addition, because senior drivers are more susceptible to glare, the amount of light above the horizontal and to the left of the axis of the headlamp needs to be reduced.

To overcome the glare from street lights at night and from sky glare during the day, the sky band at the top of the windshield can be very protective of older drivers; it should be standard on all cars. Tinting of the windshield to absorb solar heat wastes fuel dollars at night since useful light is absorbed before it reaches the eye. A tinted windshield is like putting a light absorbing filter over every street light and head light. The desirable sky band and undesirable overall tinting usually go together in American windshields. The value of the overall tinted windshield is questionable even for daytime use since it adversely affects the visibility of red signals.

The windshields of old automobiles are usually pitted and scratched as well as dirty. Young drivers with old windshields have many of the problems an older driver has because of his eyes. Windshield removal or resurfacing should be made inexpensively available to the motoring public. Older cars are not visually safe unless the windshield has been repolished or replaced. Many of these high hazard automobiles become the teenager's car and they undoubtedly increase accidents.

The design of our highway system needs modification for both day and night-time use by the older population. For example, better (wider, brighter) pavement striping for edge, center line and lane delineation has been shown to improve performance of handicapped drivers. The use of larger signs with more attention to the clarity of the message is imperative. Signs should be designed to provide 13 seconds or more of advance warning time to all legally licensed drivers.

Stop-and-go lights should have their amber-signal time increased to ensure that no cars will enter the intersection against a red light. The current engineering formulae assume a deceleration rate which most drivers find unacceptable and most truckers find impossible to achieve on either wet or dry pavement. Clearly, the imposition of age handicaps exascerbates this situation. The Insurance Institute for Highway Safety has data from studies indicating how the formulae need to be changed.

Although they meet governmental regulations, trucks, buses and jeeps have unusual and deceptive headlights because of their abnormal elevation and separation compared to passenger cars. Under certain rather common conditions the abnormal spacing and/or height makes the viewer think the vehicle is closer or further away than it really is.

There is no basis in highway safety for allowing headlights to be at or above the eye level of the driver of a passenger vehicle, as is legally possible now. All vehicles using the streets and highways should be required to have the headlight height and spacing within a few inches of one another so that headlight aim and light-output pattern can minimize headlight glare for everyone.

A similar visibility and judgmental problem exists for tail lights, and at this writing a

similar wide range of placements is legal. As with headlights, there is no basis in highway safety for allowing tail lights to be widely variant in height and separation.

The older driver is more susceptible to the illusory cues provided when both headlights and tail light are malpositioned.

A large number of truck and trailer accidents occur as side collisions. Some trucks and most trailers have high ground clearance and in many cases a motorist in a passenger vehicle can see the full roadway scene beneath a trailer across his path. To make matters worse, the trailer side lights are usually and legally placed above the passenger-vehicle driver's eye level. At night side lights cause even greater misinterpretation of distance than the tail and head lights. To correct the problem they must be brightened, increased in number and brought down to within a few inches of a standard height for head and tail lights above the roadway. The present intensity of trailer side lights is too low even for young drivers!

The warning lights placed at railroad crossings are not bright enough in the daytime to be 100% effective even for young drivers. Approximately, a fourfold increase in brightness can be obtained simply by changing to a halogen light bulb and another factor of 2 by changing to the newly standardized brighter red filter (roundel). In addition, strobe flashers on the signal posts and the greater use of gates would provide the still greater protection needed at some crossings. Thus, there seems little excuse for our railroads to continue operating a borderline safety system. The need for better signals is most acute for older drivers because the normally inadequate train horn is even less effective on those afflicted with age-related losses in hearing. Brighter signals with better advance warning should be a minimum goal!

Collision Course

The problems faced by the older driver include the detection of vehicles and pedestrians on a collision course. The usual collision course is a threat difficult to see because the approaching object does not move left or right but just grows in size. Peripheral vision is especially good at detecting objects moving left or right but not growing in size. Shadows, inadequate vehicle visibility, sun glare, rain, snow, among other hazards, can further reduce the capacity of peripheral vision to warn the driver of an impending collision. One excellent solution is to increase the visibility of all vehicles and pedestrians. The use on cars of high-mounted running lights which are turned on by day as well as night and which can be seen from any direction will greatly enhance driving safety. For pedestrians, flash lights and reflectorized clothing at night and bright clothing by day will improve their safety.

Other objects which do not move left or right are the windshield corner posts and the rearview mirror. A collision course at an intersection can put each colliding vehicle behind or near a normally ignored vehicle structure as seen by the other driver. Such structural members need to be made as visually inconspicuous as possible. Thus narrower windshield structures and a higher placed inside rearview mirror are needed on future motor vehicles.

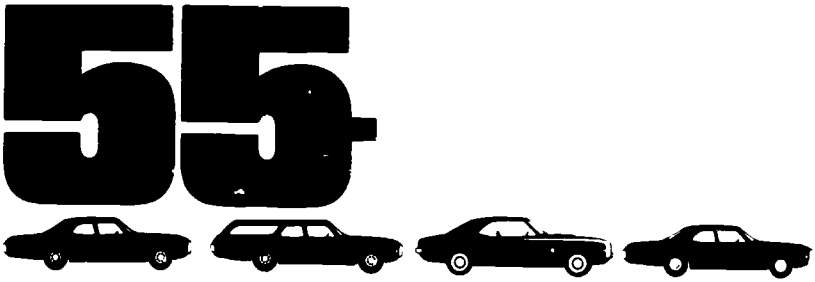
Motorcycles

While relatively few older people drive motorcycles, many are involved in turning in front of oncoming motorcycles. The poor visibility, illusory factors and high-velocity capability of motorcycles should make special visual treatment mandatory. The use of the motorcycle headlight whenever the engine is running is an excellent safety measure, but it still is not enough. The high-positioned single motorcycle headlight is easily lost among automobile headlights and is easily judged to be farther away than in fact it is. Headlight height should agree with that of other vehicles, and the light should be flashed to clearly signal that a motorcycle is present. A device called the Q-Switch is

available to do this automatically. Headlights flashed both day and night will greatly assist the older and all other drivers to detect, locate and identify all motorcycles in the traffic flow. The payoff will be a reduction of over 50% of all "motorcycle to motor vehicle" accidents.

Conclusion

The principles of correction are basic, and reforms would be inexpensive compared to the present costs in accidents. The accomplishments of the needed changes described herein will take constant, dedicated, goal-oriented and cooperative effort by individuals, industries and government. Changes can and must be made. When *they have been made*, the accident rate will, in my opinion, easily drop 75%, i.e., to less than 25% of the present rate.



Safer Cars for Seniors

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In the last twenty years, the Nation's traffic safety programs have helped us to hold the line against injury and death in spite of further increases in the number of licensed drivers, the number of cars and trucks on the road, and the number of billions of miles driven. The picture may change for the worse in the next decade or two. While the number of teenage drivers may decrease as the crest of the "baby boomers" passes on toward middle age, the number of older people will be increasing. Improved health care has enabled them to avoid some of the causes of early death. Older people may not be as frequently involved in traffic crashes, but their injury is much more likely to result in permanent impairment or death. Older people are more fragile; their bones break more easily, and circulatory and other impairment is apt to interfere with the healing process.

Protection From Injury

One of the major elements of our national traffic safety program has been the safety improvement of cars, especially in the car's capacity to protect its occupants when a crash does occur, for whatever reason. Older drivers have benefitted, particularly those who have made use of the new safety features. When a car stops abruptly in a crash, the occupants can strike the interior with great force. The resulting bone fractures, crushing bruises, and the brain damage associated with head impact are serious and sometimes even fatal for young people. For older people such injuries are much more likely to be fatal.

Accordingly, the most important safety improvement in cars has been the addition of seat belts and particularly, the addition of shoulder belts as well as lap belts for the driver and right front passenger. These have been standard in all cars manufactured for the United States market since 1968. When worn, they have proved highly effective in reducing the occurrence of serious injury. They have one major limitation: they need the motorist's cooperation in regularly using them and using them properly — with the lap belt adjusted snugly across the thighs, under the abdomen, and the shoulder belt

worn on top of the shoulder, **not** under the arm. To overcome this disadvantage, efforts in education and persuasion by safety councils and other public service groups are being supplemented by laws requiring belt use. Admittedly, there will be many instances of refusal to comply, and enforcement will be limited. Nevertheless, used belts will substantially increase as state after state passes such laws.

"Air bags", that is, cushions that are instantaneously inflated at the moment of crash, have been urged as a substitute for the belts. No cooperation is required of the car occupants; that is, the main advantage of air bags. Unquestionably, many lives would be saved and the number of injuries reduced, primarily among the many motorists who have failed to avail themselves of the protection offered by the belts already in all cars. Insurance companies would greatly benefit, too; understandably, they have been pressing legislators and the National Highway Traffic Safety Administration to establish requirements for air bags in all new cars. The implication has been that air bags would take the place of belts.

Air bags have several serious disadvantages. For one, they are expensive. The one offered today by one manufacturer for the driver is standard in his highest price cars. In his compact cars, it adds $880 to the price. As standard equipment for all cars, air bags would cost much less, but the cost would have to be multiplied by two or three if all front seat occupants had to be provided for. It is regrettable to have to contemplate putting substantial additional cost into all cars just because many motorists are neglecting to use the highly protective belts they have already paid for. However, we all are already paying for their neglect in higher insurance premiums and taxes for the care of the crippled and the survivors of those who did not survive. With few exceptions, insurance companies have not provided premium reductions for those regularly using the belts. Their rationale has been their inability to determine whether at the time of the accident, the occupants were actually wearing the belts.

As a substitute for lap and shoulder belts, air bags have another major disadvantage: they provide no protection in broadside impacts or in a rollover that is not preceded by a major forward impact. Shoulder and lap belts are highly protective in many such events by keeping the driver in place and away from the area of impact when his car is hit broadside on the far side. Belts are also likely to keep the occupants wholly within the car. Occupant ejection, even partial ejection, has been a major factor in critical and fatal injury.

In sum, lap and shoulder belts are here to stay. They deserve the active cooperation of all motorists. The air bag has been given its correct status by Mercedes Benz — as a supplement to the belts, specifically, as additional protection to come between the driver and the steering wheel at the time of crash. In providing this supplementary restraint for the driver, Mercedes has urged the continued use of the belts.

In its cars equipped with the supplementary restraint, Mercedes has also increased the probable effectiveness of the front seat belts by providing instantaneous tensioning at the moment of crash to take up slack and to take up some of the belt stretch that occurs when the occupant heavily loads the belts. Thus, the occupant is even less likely to hit the rear view mirror, the windshield, the instrument panel, or the controls in front of him.

Few will benefit immediately from these advancements: Mercedes cars are among the most expensive. However, the example has been set and others are bound to follow. In the meanwhile, many millions of cars will be sold with lap and shoulder belts alone. Especially since these belts will be continued even with the introduction of air bags, further improvements should be made to the belt system.

As long as the front seat occupant in a two-door car finds that the belts are hard to reach, especially for the older arthritic person, as long as short people can justifiably say

that the shoulder belt scrapes the neck, as long as rear seat belts are hard to find and put on when three people get in and close the door before trying to put the belts on, as long as belts are sluggish in retracting and get caught in the door and get dirty and even damaged, there will be plenty of need for improvement. Such improvement in design can be expected to increase the use of belts. Every percentage of increase nationally will mean another million people are being protected.

Better protection is also needed for the front-center passenger when there is a front-center seating provision. In a forward crash, that passenger even when wearing the lap belt may hit the windshield or the very hard structure over it. He may also hit the rear view mirror. There has thus far been no provision for a shoulder belt. One could be offered to those who need a front seat for three occupants. Several designs have been demonstrated, including one in which the upper end of the belt could be detached from its overhead anchorage and lapped over the back of the front seat. A diagonal belt could be used, such as is now provided for the driver and the right front passenger, or an inverted "V" design that in the past trials seemed preferred by women. Again, when not in use the belt could be detached and draped over the front seat and latched to a stowage anchorage below.

It would also be desirable to improve the present front-seat shoulder belts by reducing their elongation under crash loading. Excessive elongation in some front-seat shoulder belts is due, in part to the great length of webbing that is stretched. Typically, the shoulder belt runs upward and rearward after passing over the shoulder and then passes through a loop and goes over the shoulder and then passes through a loop and goes down toward the floor to the belt retractor. Mounting the belt retractor at or near the roof would reduce the length of webbing that is stretched. An alternate solution suggested many years ago by Professor John Ryan of the University of Minnesota of providing a belt tensioner that would operate at the moment of crash to take up belt slack and prestretch the belt would seem to have merit. It has been adopted by Mercedes in their newest restraint system.

Lacking such a tensioning system, the motorist had better be rted to the importance of protecting himself by maintaining a good posture, with his lower back pressed against the seat back cushion, remaining in that position with the help of the snugly fastened lap belt, and guiding and urging the shoulder belt toward its upper end and thereby helping the retractor do its job. The retractor could be wound tighter so that it would not need such help. There has been justified concern that the resulting pressure upon the shoulder might cause some customers to complain — and even stop using belts. A simple and convenient provision for motorist adjustment of shoulder belt tension might be very helpful if adequately explained in the owner's manual.

Rear seat passengers should also be offered more adequate protection than is provided by just a lap belt. Shoulder belts could be offered at least as an option. More than one manufacturer is providing shoulder belts for two of the three rear seat passengers. Equivalent protection should be offered for the center passenger, too.

Another restraint system that needs improvement, especially for the benefit of senior citizens, is the head restraint, sometimes called the head rest. In some cars this is an additional cushion or structure extending above the top of the seat back. In other cars head restraint (against rearward motion in an impact from the rear) is provided by simply making the seat back high enough. Older persons particularly need such protection if they sit with a head-forward posture. They often suffer from arthritis and the neck is apt to be involved. In such people, excessive rearward head motion in an impact from the rear is likely to cause increased suffering. For best protection, the front face of the restraint should be close to the back of the head without causing annoyance. Thus, the protection offered is dependent in part on the occupant's maintaining a good posture. Persons who sit with the head forward may lose much or

all of the intended protection. Provision of fore-and-aft adjustment could compensate somewhat for posture variation. For lack of such adjustment, a firm cushion could be added to the front face of the head restraint. The added cushion should be just as firm as the head restraint itself, not soft like a bed or sofa pillow.

The front center seating position, where there is one, has not been provided with head and neck protection comparable to that which has been made standard for the left and right front positions. When three couples go out together for dinner and the theater in a six passenger sedan, the front center seat must be pressed into use. The center seat passenger is just as much in need of protection against whiplash injury as the others. When not in use, the center headrest could be lowered into the seat back.

Head restraints should also be made available for rear seat passengers. They are already standard in some cars for the left and right rear passengers. Again, the center passenger needs protection, too.

It has been widely recognized that head-impact injury represents the greatest threat of fatality or permanent impairment of car occupants involved in crashes. Accordingly, the cushioning of hard, unyielding structural surfaces that are being struck by occupants' heads is imperative. This includes the structure over and around the windshield and over the doors, as well as the door pillars. The structure over the windshield is most likely to be hit by the occupants who do not wear seat belts, and even by some of those who do but leave them poorly adjusted. The roof rails, the structure over the side doors, can be hit by the adjacent occupants even when they are wearing properly adjusted belts. An inch or more of protective cushioning could easily be applied in large cars and is being planned on a few models. In the smallest cars an inch of cushioning would tend to force the adjacent occupant to move his position inward toward the center of the car.

The new windshields, with their added plastic layer on the inner surface, can be expected to provide increased protection against facial laceration that occurs when head-impact cracks and grazes the glass without the head breaking through. Even though the glass shards stay in place, their sharp edges can produce a slicing action. The tough new plastic layer on the inside surface of the windshield tends to cover those edges and prevent them from showing through. This is another step that has been taken to protect the many who have not yet developed the habit of regular belt use, as well as those who have.

To protect the driver from fatal or near fatal injury when his vehicle is struck broadside at the left front door, a more radical design may be needed. Lap belts, shoulder belts, air bags, and even the present door-reinforcing beams are of very little help when the other vehicle plunges into the side of the car.

A far more adequate design for driver protection would place the driver squarely in the center of the car, as far away from either side as possible, and would provide him with a seat and a restraint system that would adequately limit his lateral movement toward the point of impact. This was the approach taken by Ed Dye some thirty years ago in the designing and building of his Cornell Safety Car. A front seat passenger could be on either side of the driver, immediately adjacent to the door. The passenger's risk of serious injury in the event of broadside collision would be the same as that of the right front passenger in today's car; the driver would be much more adequately protected. Many crashes involve a vehicle having only one occupant — the driver.

Vision and Visibility Aids

Several design features that are not standard on all cars can improve the driver's view of the traffic scene around him. One is the state-of-the-art air-conditioning system with its reheat feature. One of the hazards of winter driving is the fogging of the

windshield chilled by cold air on the outside. When conditions are particularly bad, the fogging can extend to side and rear windows as well. Some relief can be had by driving with the windows open, but a much more satisfactory solution is available by the modern air-conditioning system when the temperature control is set at or above midrange and the air-conditioning mode is selected. With that arrangement, the air that is drawn in is chilled, and the condensation occurs within the air-conditioner. Then the dried-out air is reheated before it is discharged through the defroster and heater outlets. The result: no fogging. If some had already occurred, it disappears.

Another winter driving hazard occurs at night on a dark, wet road treated with salt to melt snow and prevent icing. Dirty salt spray thrown up by the car in front quickly dries on the hot headlights and forms an opaque film, leaving the driver wondering if the headlights are still on. Safe driving at night depends heavily on adequate headlighting of the road when there is no other illumination. Headlight washers and wipers are sorely needed under such circumstances. Very few cars have offered them, even as extra-cost equipment. At least one manufacturer offered them on a few models and then, after two years discontinued them for lack of car-buyer interest. They are available on some cars in Europe but are associated with a design of headlamp that has not as yet been authorized for sale in America by NHTSA. One way or another, they will again become available here and will be well worth asking for.

Supplementary driving lights can also be helpful at night, especially if they are mounted low, typically below the bottom edge of the bumper. Such lights give additional road illumination with proportionately much less glare thrown back to the driver's eyes, especially in fog or snow. These lights need motorist cooperation; their closeness to the road makes them much more vulnerable to stones and other road debris thrown up by a car ahead. Plastic covers are slipped over these lights when they are not in use, and the driver has to get out and remove them when he wants to use the lights.

Electrically heated rear windows, available for many cars as a factory installed option, can shed ice and snow and dry off inner surface condensation as well. Rear window washers and wipers very capably clean dust and dirt off the outside surface. Both options should be available for all cars.

Many cars offer outside rear-view mirrors that are adjustable from inside, an especially helpful feature for the driver who has to readjust the mirrors each time he uses the car. Perhaps the eye height and seated position of the previous driver were different from his. Any adjustment can be made more comfortably, especially in inclement weather. Adjusting the right outside mirror is very difficult without remote control because correctness of adjustment can best be determined with the driver in the driving position. He cannot maintain that position if he has to slide across the car to move the mirror.

Outside mirrors can be flecked with snow or ice when driving in a storm and in severe conditions can be rendered almost useless. Electrically heated mirrors are available for many cars to combat this condition. They can melt any ice and snow and keep the mirror surface clear.

Drivers who appreciate having as wide a field of view as possible may prefer convex mirrors. Some find these mirrors very helpful for the left side as well as the right. Others reject curved mirrors in any location because they find it too difficult to adjust to the accompanying reduction in image size. In the curved mirror, the car that is twenty feet to the rear may seem to be forty feet away. Failure to adjust to this illusion can result in a serious driving error. Convexly curved, inside rearview mirrors are also available; it may be desirable to choose such a mirror if curved outside mirrors are to be used, but it would be important that all curved mirrors have the same radius of curvature, in order that a car to the rear appears to be the same size in each mirror.

A desirable design element for both forward and rearward visibility is the location of the anchorage of the inside rear-view mirror on the roof structure immediately above the windshield rather than on the windshield glass. With what could be called a roof mount, the mirror can be moved considerably fore and aft as well as laterally. When the driver is in position, he can move the mirror closer to him than is otherwise feasible and thereby increase his field of view. At the same time, he can set the mirror so that it is out of the field of forward view, which may not be possible with a windshield-mounted mirror if the driver sits tall in his seat.

Signalling Systems

Signalling systems on cars have not changed very much over the years. The stop lights still have the same brightness day and night, and they do not differentiate between night and day. There are some safety-related differences among the various car makes and models that are worth noting.

Generally, both the stop and the turn signalling functions have been performed by the same lamps. If there is only one such lamp on each side and one or the other lamp burns out, no stop or turn signal is given on that side. If the left rear stop/turn lamp burns out, for example, the driver preparing to turn left can give no signal to the following driver. If he pumps his brakes when slowing down for the turn, the remaining stop light (at the right rear) will flash, apparently indicating that he is preparing to turn right! It is obviously desirable to have at least two stop/turn lights on each side, at least on the rear of the car. Some cars do. It is still desirable to duplicate the lights even if the turn and stop signals are provided by separate lights. If turn/stop lights are separate, it is desirable to have the turn lights be amber in color to make them more distinctive.

Turn signal and stop lamps are generally mounted just above the bumper. A few car models provide high-mounted supplementary stop/turn lights. They are located essentially, at the eye level of the following driver and are particularly likely to be noticed by him.

Generally, both the stop/turn lamps in the rear share the same housing and the same lens as the taillights. Therefore, at night a stop or turn indication consists of the brightening of an existing light. The signals, either stop or turn, are probably more attention-arresting if they go completely on and off, as is the case when the taillights are in separate housings.

Another important signalling system is the emergency flasher. On some cars the flasher controls dominate the stop light and turn signal controls; and the turn-signal lights (left and right and front and rear) all flash in unison regardless of the position of the turn signal lever and regardless of any pressure on the brake pedal. This is the desirable arrangement. On some cars there is interference between the systems. For example, holding down the brake pedal may stop the flashing action and cause the rear turn signals to burn steadily like stop lights and thereby to give a different message.

Vehicle Control Systems

For all the decades that automobiles have been in existence, braking systems have had a serious shortcoming: when the driver makes a supreme effort to stop, to avoid a crash, the brakes lock the wheels and the driver loses steering control. Once the front wheels are locked, the vehicle ignores any effort the driver may make to change his direction. By locking his wheels the driver has lost his last chance to steer out of the way.

Some twelve years ago, one American car manufacturer offered non-locking brakes as an expensive option on his top line of cars. A year or two later, the option was dropped as being of insufficient merchandising interest. Now such a braking system is once again available, this time on cars imported from West Germany. The system is standard

on the highest priced cars and optional at very high cost on some other models. At first, the availability of the ABS system (anti-lock brake system) will spread slowly, if only because of its high cost. As with other safety improvements, cost will be reduced if non-locking brakes are made standard on higher-volume car models. In the meanwhile, public acceptance will depend heavily on skill in merchandising. Vivid demonstrations have already been shown on television. What will really sell it will be first hand experience by car buyers on slippery pavement. A car with four stud tires and with the anti-lock brake system has excellent directional stability and control on even the slickest glare ice.

Power brakes are frequently ignored as a safety feature, yet they give many a motorist with less than average strength greater ability to apply the brakes. The male driver, even the senior citizen, may not be ready to admit he needs such help, but perhaps he will agree that it would be just the thing for his wife. Power brakes offer another safety advantage, that of making left-foot braking feasible. With power brakes the pedal is lower and so is more easily controlled by the left foot. Left-foot braking is not for everyone, but for the driver who takes pride in developing additional skills and who is able to do so, left-foot braking makes possible shorter stopping distances so vitally important in accident avoidance.

Greater Risk of Fatality in Small Cars

Consideration of the safety aspects of automotive design cannot be adequate without maintaining awareness of the very large difference in frequency of fatal injury among occupants of small cars and large cars. Highly competent analysis of thousands of urban and rural highway crashes has revealed that three times as many fatalities have occurred per hundred persons involved in crashes in subcompact cars as in 4500-pound, full-size cars. When the experience in compact rather than subcompact cars was compared, the ratio was still two to one. Furthermore, it was found that when two compact cars collided, fatality was twice as frequent as when two full-size cars collided. Thus the additional risk of fatality in the compact car was not related solely to occurrence of collision with large cars. This information should certainly be given prime consideration by a safety-conscious motorist who is trying to decide whether to replace his present car with a smaller, lighter model.

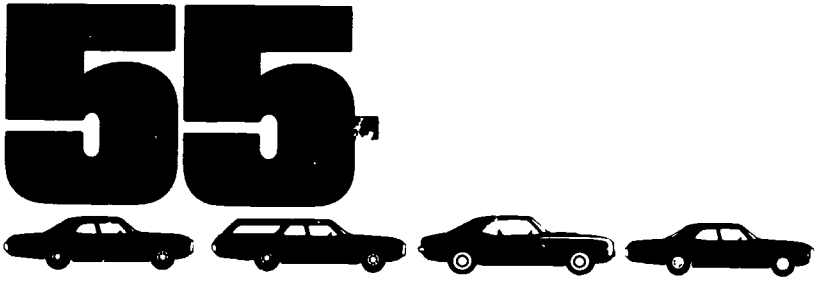
WHO NEEDS TO DO WHAT TO GET SAFER CARS FOR SENIOR CITIZENS (AND OTHER MOTORISTS)

This overview of automotive safety, of what is available, and what more needs to be done, suggests the following priorities:

1. The motorist needs to give more attention to safety as he prepares to choose to keep the car he has or buy a replacement, and to elect the safety-improving options available, to the extent he is financially able.

   To do this wisely the motorist needs far more information relating to the safety merits and demerits of various car designs and of available optional equipment than he has today; and he needs that information from truly qualified sources of impeccable reputation. For each car make and model he wants to consider, he should have a list of the safety-related features that are standard and another list of optional equipment available. Also available for the prospective customer's planning session should be a series of paragraphs, one per safety feature, explaining the safety pluses and minuses of that feature. For example, the power steering benefits outlined above would be accompanied by the revelation that adequate inspection and maintenance of the power steering system is particularly important; the failure of the drive belt and consequent loss of power-assist would require a steering effort greater than normal.

2. As indicated herein, there is plenty left for the manufacturer to do. For the most part, the consumer is not in a position to improvise additional safety equipment or features. Equally important, the manufacturer can help himself as well as the consumer by doing more to make the consumer aware of the availability of additional safety features. His dealers may not be representing him very well in this respect. With regard to automotive safety, present merchandising techniques and emphasis do not appear to be adequate. Had they been, it is doubtful that features like anti-lock brakes would have been dropped as they were a decade ago.



Licensing the Chronometrically Impaired Driver

Newman Jackson, a lifelong Texan, has completed 42 years in Traffic Safety. Thirty-six of these years were with the Texas Department of Public Safety in all capacities from a field driver's-license examiner to Assistant Chief of the Driver's License Division to Chief of the Inspection and Planning Division for all department activities. After high school, Jackson resorted primarily to on-the-job and self-education. Aiding his efforts along his career path were some 15 specialized courses at Northwestern University Traffic Institute, the University of North Carolina, Memphis State University, the University of Tennessee, Texas A&M University and the University of Texas. Interspersed also in his career have been numerous extracurricular responsibilities such as:

- ***Chairman of the American Association of Motor Vehicle Administrators Driver Licensing Committee for four years.***
- ***Panel member participation in numerous research studies.***
- ***Chairman of the Traffic Law Enforcement Committee for the Transportation Research Board, Washington, D.C. for six years.***
- ***President in 1977 of Region Two, American Association of Motor Vehicle Administrators.***

In addition to Jackson's first-hand field and administrative perspectives, he has been viewing the traffic scene as a 55-plus driver for many years.

Introduction

Social concerns for drivers 55+ and over should be no greater than the concerns for drivers 55 and under for the following reasons:

1. Age group demarcations may be arbitrary. Chronology often differs from physiology and psychology.
2. Discriminatory controls for any age group would be illogical, undemocratic, unscientific, unjust and unwelcome.
3. The basic components and requirements for safety are the same for any age group — or individual.
4. Senior drivers are entitled to as much protection from junior drivers as junior drivers are entitled to from senior drivers.
5. The ultimately effective skills, knowledge and attitudes (physical, mental and emotional) must be implanted before original licensing as a driver. The better the younger driver, the better the older driver.

6. Every driver should be recognized and treated as a unique individual. The libertarian view is appropriate here. If the individual is treated justly, any group to which he or she belongs cannot be treated unjustly.

Historically, much has been done to keep impaired drivers (from age or other reasons) on the road. Motor vehicle administrators have bent every law in the statutes to encourage, test and license with restrictions in such a manner as to keep senior drivers at least on some necessary and/or convenient roads, sometimes even beyond reasonable limits of risk. Progressive administrators in the motor vehicle field, however, agree with Donald J. Bardell, Executive Director, American Association of Motor Vehicle Administrators that motor vehicle departments must prepare to do much more in order to serve the increasing mass of older citizens whose numbers of age 65 and over are expected to exceed 31,000,000 by 1990. To prepare for this service a complete inventory of opportunities and problems to be encountered by administrators, educators, engineers, researchers and older drivers is in order. However, I shall confine this discussion to a synopsis of comments and suggestions based on the recall of several problems from my own experience. In so doing this broad spectrum introductory quote is in order: "We are all faced with a series of great opportunities brilliantly disguised as impossible situations."

Problems of Administrators

Motor vehicle administrators must contend with:

1. Myopic views of research within their own ranks.
2. "More of the same" delusions as the answer to too many problems.
3. V.I.P.'s.
4. Politicians.
5. Obligations that expand faster than resources.
6. Aversions to innovation.
7. Bureaucratic mediocrity in their own organization.
8. Timid leadership in their professional associations.
9. Resistance to change.
10. Subtle usurpation of the motor vehicle administrator's decision-making responsibility by medical advisory boards.
11. Administrators, as younger drivers (even when they do not retire until age 65 or even 70, they do not classify themselves as age affected), must define the problems and devise and execute the solutions for "older" drivers — often without adequate representation for the drivers affected.
12. Over representation in the public mind of senior drivers as responsible for traffic chaos.

Problems of Researchers

The primary problem of researchers in public traffic safety is the failure of too many administrators to recognize that research is as much a part of the real 20th Century world as their administration, and further, that research may compress the equivalent of years, or even generations of experience into a few months often reaching even more accurate and dramatic conclusions. A secondary problem is the sometimes unrealistic research which creates the skepticism referred to above.

Problems of Older Drivers

For convenient reference problems of older drivers are divided into several categories.

1. Psychological and attitudinal problems.
   a. Stereotyped concepts of older drivers by younger drivers as well as stereotyped concepts of younger drivers by older drivers. This results in clashes instead of cooperation. Witness the frequency of horns, hands and revved up motors signalling "Get your ----- off the road, old man," and the responding cues decipherable as "That young whippersnapper ought to be arrested."
   b. The "once a good driver always a good driver" syndrome.
   c. The last-breath struggle to maintain personal liberty and independence.
   d. The inability to recognize when driving has become a task too demanding to undertake.
   e. Underconfidence.
   f. Overconfidence.
   g. Phobia-like reactions to trucks, speed, congestion, darkness, rain, wind and other driving stresses.
   h. Low risk perception.
   i. For senior drivers, insufficient information and instruction relating to the physical, mental and emotional aspects of driving.
   j. Staying out of "sync" with the traffic stream.
   k. Hardships from inadequate transportation to secure the necessities and conveniences of life.
2. Physical and Medical Problems.
   a. Individual uniqueness, as so well and so long documented by Dr. Roger Williams of The University of Texas.
   b. Single and multiple visual deficiencies.
   c. Slower and vaguer reactions.
   d. Impaired body articulation.
   e. Hearing loss.
   f. Memory loss.
   g. Senility (often more definitively Alzheimer's disease).
   h. The gradual pace of deterioration, making it hard to draw the line.
   i. Unverified, vague and vertical illnesses, resulting in more crashes than diagnosed diseases and discernible handicaps.
   j. Conspicuous absence of up-to-date preventive health information.

Solutions

Consideration of the following activities is suggested to alleviate the problems outlined in this discussion. They should be undertaken with several basic realizations:

1. Driving is a highly skilled, hazardous occupation.
2. There is no such thing as a safe driver — only a careful driver.
3. No driver ever gets good enough in his driving.

Educational Solutions

1. Truth in advertising is in order. The public (including age 55+ drivers) turns much of our advertising off because they experience that we do not tell them the truth, the complete truth. We attempt only to psychologically coerce through accenting

negatives. Admitting that heart disease, for example, is multiple times more fatal than driving; that half again as many persons are killed in falls (maybe we should license people to walk); that thousands of unstatistically recorded lives are saved by the automobile; the knowledge that you would have to live over 30 life-times to insure demise in an automotive crash might well increase the number of drivers who will stay tuned to safety messages.

2. Linguistic research is in order. The "accident" label is killing us. Thus, a crash continues as an act of God instead of a deed of the Devil. Anyone who doubts this has only to research hundreds of examples — such as the growth of the originally unpopular Death Insurance into Life Insurance or the miracle of the unsaleable Rose fish transformed into Ocean Perch to become and remain the largest selling fish in America.
3. Emphasis on The Educated Instinct And Perception Syndrome, the real secret of Traffic Safety, is in order. Defined, it is acquired knowledge subconsciously working with the instinct of self-preservation to prevent harm.
4. Reinforcing physics with metaphysics is in order. The law of Discovered Peril (or the Last Clear Chance) is one of the most undertaught laws in the statutes. Fellow drivers should be rescued from their plight whenever possible, irrespective of their error. Discovered Peril is simply the early application of "I am my brother's keeper."
5. Recognition of certain hypotheses in Rupert Sheldrake's "New Science of Life" may be in order to encourage educators. Monkeys on an island learned to wash their food. Soon after monkeys on a completely isolated second island mysteriously through "Morphic Resonance" began washing their food, too. Could it be that mankind so responds, also?
6. Attention to right (brain) hemispheric training is in order. On the basis of research in this field, Dr. Gabe Campbell restructured standard left-brain curricula toward right-brain thinking and transformed high school drop-outs into "A" students.
7. Introduction of appropriate stress-management techniques into driver education curricula is in order.
8. Intensified instruction in driver self-restriction is in order.
9. Selectively more of the same things we have been doing is in order while we innovate new directions.

Engineering Solutions

Every reasonable effort should be made to bring space age technology to the rescue. Some examples are:

1. Subliminal car-safety messages on cassettes. "I'm always a careful driver". "I drive within the speed limit." "I'm a courteous driver." "I obey all traffic laws." These messages to the subconscious mind might prove as effective on the highway as comparable messages have proved in reducing theft in super markets and increasing popcorn sales in theaters.
2. Installation on automobiles of "Mutually Assured Survival" anti-crash sensors.
3. Expanding use of continuously updated radio warnings and advisories electronically beamed into the automobile from the road system.
4. Air bags with new life breathed into them.
5. Special roadways for older drivers. Is this more unthinkable than special walkways for pedestrians or special bike lanes for bicyclists?
6. As with education we must selectively continue correct programs while we innovate better ones.

In applying technology it is appropriate to consider this question: "If we left as much responsibility up to the pilot as we do the driver, would flying be safe?"

Administrative and Enforcement Solutions

Necessity must nurture cooperation with innovation. In addition to activities suggested in other categories, opportunities include:

1.

1. Phase out the futile one-on-one speed enforcement philosophy in favor of electronic modes.
2. A re-look at governors on automobiles.
3. Application of "One Minute" management techniques to increase current output by 25% with existing personnel and equipment.
4. Dramatically increased emphasis on the spirit-of-the-law enforcement as opposed to the letter-of-the-law enforcement. (Example from a Texas law enforcement guide: "Nothing herein is binding when it blindly conflicts with the administration of justice."

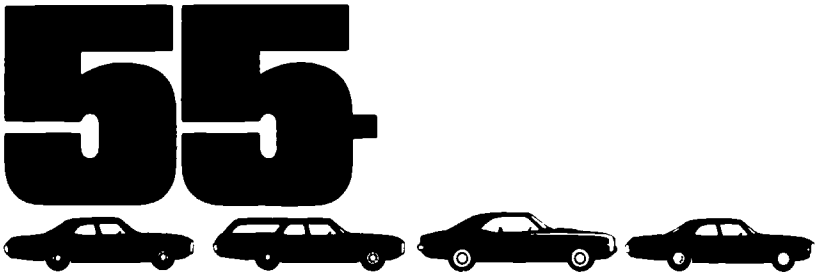
Physical and Medical Solutions

Incalculable benefits can come from intensifying public awareness of:

1. The Standard American Diet (S.A.D.) links to traffic "crime". Authority: Dr. Roger Williams, University of Texas; Dr. Ruth Yale Long, Nutrition Education Association, Houston, Texas and a host of other research colleagues.
2. Iatrogenic crashes.
3. The insidious hazards of hypoglycemia — affecting up to 90% of the population.
4. The corrective health potential offered by healing arts in addition to those recognized by the American Medical Association and the insurance industry.

CONCLUSION

Administrators should expect, recognize and intercept periodic cycles of retrogression precipitated by recurring overloads. The foregoing comments interface in many places. The suggestions, while intended to focus on 55+ drivers are often inseparable from the universal spectrum of all drivers. As demonstrated by Canadian researchers over 30 years ago, we all drive as we live, and conversely, I suppose we live as we drive. Therefore, better driving also means better living.



AUTO INSURANCE: Needs and Problems of Drivers 55 and Over

Edward R. Klamm is a consultant for Allstate Insurance Company, where recently he completed a 33-year career that involved: pioneering the high school driver-education program, establishing university safety-centers, coordinating safety council activities and other national safety efforts. He co-sponsored the nationally recognized research project, "Grades, Cars and Jobs" involving high school students. He has received awards from the American Bar Association, American Association of Motor Vehicle Administrators, National Safety Council and Northwestern University Traffic Institute and others. At present, he is a member of the Traffic Safety Advisory Council to the Illinois Secretary of State and coordinates the activities of the Traffic Safety Committee, Chicago Association of Commerce and Industry. He is also active with the Alliance Against Intoxicated Motorists (Illinois) and the Cook County (Illinois) Court Watchers Program. A graduate of Northwestern, Mr. Klamm has a close relationship with the University's Traffic Institute.

The rule of the road for a flashing red light is to "stop, check all traffic and then proceed with caution." Another rule, as in approaching an unprotected railroad crossing with poor visibility, is to "stop, look and listen" before proceeding. These precautions are excellent advice in considering and purchasing automobile insurance.

This precaution, driving in today's environment and in purchasing auto insurance, applies to all drivers, not just those over 55. Nevertheless, there are certain inherent factors relative to auto insurance for each specialized age group. So, let's take a look at the auto insurance field, to determine whether there are special problems for drivers 55 and over.

Background

The insurance policy is a relatively recent development. The concept, however, is by no means new. The idea of transferring the risk of loss from the individual to a group began thousands of years ago.

In 1752, Benjamin Franklin was instrumental in founding a fire insurance company, the Philadelphia Contributionship for the Insurance of Houses from Loss by Fire.

Today, insurance is a vital part of modern life. Nearly every individual in our society is exposed to a number of risks. And the insurance industry offers financial protection from these dangers. Generally, insurance provides security against four types of risk.

These include:

1. The risk of premature death. That is why people buy life and auto insurance.

2. The risk of loss of earning power. Auto insurance, among other policies, provides financial solvency.
3. The risk of loss of property. Many types of insurance policies, including auto, offer protection from this type of loss.
4. The risk of legal liability. Insurance protects from lawsuits arising from certain negligent acts or omissions — as for example, in auto crashes.

Many people today are covered by various types of insurance for most of their lives. The principles behind insurance are important in our everyday "use of an auto" life style.

Risk, peril and *hazard* are important terms in insurance.

1. Risk refers to the uncertainty as to a loss to an individual or property covered by insurance.
2. Peril is the possible cause of a loss, such as, in an auto accident.
3. Hazard increases the likelihood of a loss from some peril. Hazards are divided into four major classifications: physical, moral, legal and occupational.

Insurance companies face the problem of measuring risk. They are the custodians of the policyholders' premium dollars. They need to know when to accept the risk and how much to charge.

By compiling enough data, the insurance company is able to predict with some accuracy, how often various types of losses will be incurred. The company, then, can spread its risks in these ways:

1. Numerical spread. When an insurance company deals with a large number of risks, the company can predict the percentage of losses and set rates.
2. Geographical spread. The company avoids concentrated losses by spreading risks in different parts of the region and country.
3. Diversity of kind. Handling various types and lines of insurance.
4. By classifications, such as age, sex, type and model of car.
5. By reinsurance. Transfer of portions of potentially large losses to other insurance companies.

Auto Insurance

Modern auto insurance is designed to protect against the economic losses the auto can inflict in a matter of seconds. Most people today rank auto insurance as "very important" or "absolutely essential". It is the most widely purchased of all property-liability insurance.

Yet many people are confused about how premiums are established, how rates are figured, what coverages should be bought and how to save money in buying them.

Auto Coverages

Let's review these coverages. (*See Figure 1.*)

People buy *liability* insurance to pay for losses that they may cause others to suffer. The liability coverage calls for the insurance firm to defend the policyholder in all suits seeking damages after an auto accident, even if the suits are groundless, false or fraudulent.

A *policyholder* selects limits for the *bodily injury* and *property damage* liability coverages.

Uninsured motorist coverages are optional in some states and mandatory in other states.

Figure 1.

An Automobile Insurance Policy

An automobile insurance policy is made up of various parts or coverages which provide the insured with financial protection. Two of these coverages, comprehensive and collision, have applicable deductibles (an amount of money you will pay toward a loss). Most of the coverages will pay for losses up to a certain dollar limit. Your insurance agent will be able to help you select the coverages, limits and deductibles which you need and which vary by state.

Liability Coverage Bodily Injury and Property Damage Liability Protection	Protects • You, or resident relatives - driving your car • driving other cars with owner's permission • Others driving your car with permission	Pays Covered Persons for • Certain defense costs • Cost of bail bonds connected with accident • Emergency first aid	Pays Others for • Death • Injury • Disease • Sickness • Medical Services (hospital, doctors, etc.) • Loss of Services • Loss of Income • Property Damage
No-Fault Protection (varies by state)	Covers • You • Your passengers in many states • Resident relatives	Pays Covered Persons for • Medical Services • Loss of Income • Loss of Services • Funeral Expenses	
Uninsured Motorist Coverage	Covers • You • Your passengers • Resident relatives • You and resident relatives as pedestrians	Pays Covered Persons for • Injury • Death • Disease • Sickness • Property Damage (some states)	If the uninsured motorist is legally liable
Underinsured Motorist Coverage	Covers • You • Your passengers • Resident relatives	Pays Covered Persons for • Injury • Death • Sickness • Disease • Property Damage (some states)	If the underinsured motorist is legally liable
Medical Payments Coverage	Covers • You • Your passengers • Resident relatives	Pays Covered Persons for • X-Rays • Surgical • Ambulance • Physician • Hospital	• Dental • Funeral expenses • Many other expenses
Collision Coverage	Covers • Your insured vehicle	Pays Covered Persons for • Repair or replacement of vehicle (up to actual cash value)	• Limited Collision and Broad Form Coverage (Michigan only)
Comprehensive Coverage	Covers • Your insured vehicle	Pays Covered Persons for Damage caused by— • Falling objects • Fire	• Theft, Vandalism • Explosion • Earthquake • Many other hazards

There also is *medical payments* coverage: liability or fault is not a factor.

Then, there is the *collision* coverage that gives protection to an insured when his or her car is damaged.

And there is the *comprehensive physical damage* coverage, which is very broad and protects from the weather, thieves, vandals, riots, etc.

Esther Peterson, former assistant to the President for Consumer Affairs, comments in the foreword of the publication *Policy Wise* by Nancy Chasen:

> "For many, insurance is an intimidating subject. There seems to be an endless array of choices..... Too many take the path of least resistance, leaving our insurance decisions to someone else or failing to insure themselves at all."

It is best to be informed when you buy auto insurance. In most states rates vary from company to company. Driver-car classification systems can vary from company to company; one company's rules may prove to be more favorable than those of other firms. You can check an insurance company's financial soundness in "Best's Insurance Reports," available in most libraries. In shopping, you can make most comparisons by consulting at least three companies. Remember, though, that the lowest cost, or even the highest, is not always the best. A company's customer and claim services and solvency are equally important.

You should know that to comply with state law, you need to carry certain minimum liability coverages. You may wish to consider buying coverages above those limits. With auto liability insurance, the more coverage you buy, the less you generally have to pay in premiums per $1,000 coverage. Thus you may be able to add thousands of dollars in protection for a relatively minor increase in cost.

In determining how much insurance you should carry to protect your assets, talk to an accountant or attorney. An insurance agent can explain the scope of the protection of the various coverages to help you decide both type and amount of coverage. Insurance covering your car is important because of the potential of a huge judgment if you are negligent in an accident.

There is no substitute for each policyholder, 55 or over, or of any age, to read his or her policy and understand all of its coverages. If you have any question, ask your insurance agent. He or she is a good person to know.

There are a number of ways to save money on your auto insurance. Here are some tips that may help:

Consider increasing deductibles on collision and comprehensive coverages. By assuming more of the risk yourself, the portion of the premium computed from those coverages can go down substantially.

Inquire about price discounts an insurance company may offer. There may be some you wouldn't expect. The types of discounts vary widely from company to company, from state to state, and in the amounts allowed for each discount. Generally the range is from 10 to 25%. Some of the most common discounts include:

- *Good-Driver programs*, which, typically, reward drivers whose record is free of moving traffic violations and free of accidents and/or liability claims for certain periods. (On the other hand, drivers who have recent accidents and/or violations are surcharged to reflect the higher likelihood of future accident involvement.
- *Economy-Car discount*, which offers a price reduction on liability coverages for drivers of small cars that meet certain criteria.
- *Multi-Car discount*, if you insure more than one car with the same company.
- *Defensive-Driving discounts*, offered in some states, to persons successfully

completing a state-approved course.

- *55 or over discount,* offered, with varying qualification requirements, by various companies to persons 55 years of age and older.
- *Make and Model Experience Rating programs,* offered by some companies, reflect the extent of physical damage by individual makes and models of cars. Premium reductions which vary by make and model, are offered in collision and comprehensive coverages for cars that have significantly lower loss experience than the average car in that group. Similarly, those makes and models which have significantly worse experience than the average, have premium increases that vary by make and model. It may be well to shop the "Make and Model" programs of more than one company, since there are varying treatments of the same cars by different companies offering such programs.

Auto Accidents

There were a total of 152,000 drivers in the nation in 1983. *(See Table 1.)* It is interesting to review and analyze their accidents by age of drivers.

The record of drivers age 55 and over is a commendable one; in this group there were 32,900,000 drivers, or 21.6% of the total number. The senior drivers were involved in only 8,100 fatalities or 13.9% of the total, and in 4,100,000 accidents or 13.4% of the total number of drivers involved in accidents in 1983.

When one views a further breakdown, showing the frequency of accident involvement, it is noted that drivers age 55-74 have a superior record compared to all other drivers. Unfortunately, the 75-and-over drivers have ght adverse experience in accident frequency. Their fatal frequency rate was 55 pe 0,000 drivers in this age group compared to 38 for the total driver average. When we check out the all-accident involvement rate per 100 drivers in each age group, we note that the 75-and-over rate is 19 — the same rate for all drivers. Consequently, these facts send a message loud and clear to the drivers 75-and-over. That is, they must be doubly sure as to their driving capabilities and be ever attentive and alert behind the wheel.

Some older drivers have special difficulties, such as deterioration of vision, hearing and coordination. Consequently, many of them must make the following adjustments: drive the car fewer miles, especially at night or in adverse traffic situations; avoid long driving spells; fly instead of driving to far-away locations, and so on. The experienced and mature drivers take fewer chances and display a more reasonable driving behavior. Thus, they will be involved in fewer traffic arrests and accidents.

Auto Insurance Costs

In 1982, the total of auto insurance premiums paid was $44,231,933,000. The economic losses from motor vehicle accidents amounted to an estimated $60.2 billion.

An insurance study indicated 92% of all car owners carried auto insurance; in the 60-and-older category, 95% have auto insurance. In the face of continually climbing medical, legal and automobile repair costs, a vast majority of America's 152,000,000 motorists are recognizing the prudence of purchasing auto insurance. Auto liability insurance comprises almost 60% of all auto insurance purchases. Almost half of the states today require their registered car owners to carry liability insurance or to provide some other form of security.

Luxury Cars

Let's take a look at the economics of car ownership. Here is an excerpt from an article, "Luxury Cars," in *Kiplinger's Changing Times.*

Table 1

Age of Driver

There were about 152,000,000 drivers in the nation in 1963. The approximate number in each group is shown in the table below, along with each group's accident experience for the year. The figures in the last two columns at the right indicate the frequency of accident involvement; the higher the number, the higher the involvement in each age group.

Age of Drivers—Total Number and Number in Accidents, 1983

	All Drivers		Drivers in Accidents					
			Fatal		All		Per No. of Drivers	
Age Group	Number	%	Number	%	Number	%	Fatal	All
Total	**152,000,000**	**100.0%**	**58,000**	**100.0%**	**30,700,000**	**100.0%**	**38**	**20**
Under 20	14,400,000	9.5	7,800	13.5	4,400,000	14.3	54	31
20-24	18,000,000	11.8	12,900	22.2	6,700,000	21.8	72	37
25-29	18,600,000	12.3	8,400	14.5	4,500,000	14.7	45	24
30-34	17,800,000	11.7	7,200	12.4	3,600,000	11.7	40	20
35-39	14,900,000	9.8	4,300	7.4	2,400,000	7.8	29	16
40-44	12,900,000	8.5	4,200	7.3	2,200,000	7.2	33	17
45-49	11,200,000	7.4	2,900	5.0	1,600,000	5.2	26	14
50-54	11,300,000	7.4	2,200	3.8	1,200,000	3.9	19	11
55-59	10,400,000	6.8	2,100	3.6	1,300,000	4.2	20	13
60-64	8,000,000	5.3	1,800	3.1	900,000	3.0	23	11
65-69	6,700,000	4.4	1,400	2.4	1,000,000	3.2	21	15
70-74	4,700,000	3.1	1,100	1.9	300,000	1.0	23	6
75 and	3,100,000	2.0	1,700	2.9	600,000	2.0	55	19

Source: Drivers in accidents based on reports from 14 state traffic authorities. Number of drivers by age are National Safety Council estimates based on reports from state traffic authorities and research groups.
Drivers in Fatal Accidents per 100,000 drivers in each age group.
Drivers in All Accidents per 100 drivers in each age group.

"Expensive cars exact a heavy toll for maintenance, and repairing them costs considerably more than fixing cheaper cars of similar size. Insuring a luxury car can be an expensive proposition, too. It costs more for the same reason a $200,000 house is more expensive to insure than a $60,000 house.

Collision repairs on luxury cars are costly, and high visibility attracts thieves. The bigger the average payment per claim for a particular car, the more individual owners will pay. Average collision payments for luxury cars were $1,402 in 1983 for the Cadillac Sedan de Ville; $2,380 for the small BMW and $2,599 for the Porsche 944, based on statistics compiled by the Highway Loss Data Institute, an insurance industry sponsored group. Similarly, the average theft loss in 1982 — ranging from small items to entire cars — was $1,723 for the BMW; $2,055 for the Cadillac Sedan de Ville and $4,374 for the Cadillac Eldorado.

"An adult driver living in a western suburb of Chicago would pay State Farm roughly $205 dollars a year for $100 deductible collision and comprehensive insurance on a Chevrolet Impala four door sedan. The same coverage for a Cadillac Sedan de Ville rises to $358 a year; for a Continental Mark VII to $505; for a Mercedes 300D to $525; and for a Jaguar XJ6 to $565. Have the good fortune to own a Rolls Royce Corniche and you'd pay $2,260 a year to insure it for these coverages. (Liability coverage is extra and based on one's driving record.)"

The Driving Task

Driving is a full-time task. Today, more than ever, we recognize the serious extent of alcohol abuse, especially when one is behind the wheel of an automobile. Over 50% of our auto fatality problem — some 25,000 deaths plus thousands of serious injuries annually — involve drivers under the influence of alcohol.

It is revealing to review Table 2 — "Arrests by Age Groups, 1983." The number of arrested citizens 55-and-over, listed in the Drunk Driving section, spells out one reason why some seniors are compiling a tragic driving record. We all know that the aging process does to some extent diminish one's driving proficiency, including vision, hearing, reaction and coordination. When a senior citizen drinks too much it compounds these adverse effects on his or her driving. So, it is a definite no-win situation. Neither senior citizens, nor any other drivers, should drive when they consume alcohol or use drugs (including medicinal drugs). Unfortunately, alcohol abuse by drivers and pedestrians nullifies the benefits of both highway and vehicle upgrading and driver-improvement programs.

Interviews

In checking the auto insurance subject with various counselors of the North Shore Senior Center (NSSC), Winnetka, Illinois, a multipurpose service group, involving thousands of senior men and women, I was informed that the seniors did not have any major auto insurance complaints. Their primary insurance problem involved health and accident policies. The following warning was included in their bi-monthly *Members Messenger* publication.

> "Health insurance salesmen ..... Beware of anyone who is pushy and persistent. Who says, "Today is the last day I can give you this policy at this attractive price," who won't take no for an answer. Several women recently have had such a salesman at their door, and more than one has made a decision she later regretted. Know with whom you are dealing; don't be rushed; don't buy what you don't need and don't understand."

I discussed the auto insurance subject with a number of senior social welfare counselors and staff personnel of different agencies in the Chicago metropolitan area, but none were able to pinpoint major auto insurance complaints. One of the suburban counselors stated that "the primary factor for consideration by the senior members was to pass the driver's license examination and to retain their wheels."

When I spoke with NSSC Defensive Driving instructors who conducted the course (DDC) for senior citizens, the director indicated that the senior's primary concern was to qualify for the driver-improvement course discount. In Illinois, legislation designating a discount on auto liability, insurance premiums is available to certain drivers over age 55, effective July 1, 1982, if one has completed a DDC approved by the Secretary of State.

There are some 850,000 licensed senior drivers eligible for this discount. Previously, an Illinois law required all persons over 69 to take the complete driver-license examination every three years. There now are a number of provisional changes in the law so that the licensing procedures will be easier for those seniors with a "clean" record and those who have satisfactorily completed the DDC.

Nationally, the American Association of Retired Persons (AARP) launched its 55 Alive/Mature Driving program. The eight-hour refresher curriculum was developed to deal with specific needs and concerns of these drivers. The overall benefit of the AARP and DDC driving programs for seniors is safer roads for our society, but to the individual driver the economic incentive of reduced premiums is immediate and direct.

Table 2.

Arrests by Age Group

Data compiled by the Federal Bureau of Investigation shows that persons from 15 through 24 years of age are involved in a disproportionately high number of arrests for crimes and offenses which often have a direct impact on losses paid by property and casualty insurers.

A majority of all arrests in 1983 for the crimes of burglary, robbery, motor vehicle theft and drug abuse were of persons in that age bracket, who together made up only 17.5 percent of the total population.

More than one of every four arrests for driving while under the influence of intoxicants or drugs involved a person in the 20-24 age group.

Arrests, Distribution by Age, 1983

		BURGLARY		ROBBERY		LARCENEY-THEFT	
Age Group	% of Population	Arrests	% of Total	Arrests	% of Total	Arrests	% of Total
Under 15	22.0%	59,400	14.3%	9,203	6.9%	168,095	14.4%
15-19	8.2	163,249	39.3	46,044	34.4	338,129	28.9
20-24	9.3	90,587	21.8	35,914	26.8	219,233	18.8
25-29	9.0	49,858	12.0	21,252	15.9	151,919	13.0
30-34	8.1	26,536	6.4	11,676	8.7	103,166	8.8
35-39	6.9	12,436	3.0	5,131	3.8	60,627	5.2
40-44	5.6	6,155	1.5	2,240	1.7	38,753	3.3
45-49	4.8	3,111	0.7	1,187	0.9	25,935	2.2
50-54	4.8	2,057	0.5	636	0.5	20,949	1.8
55-59	4.9	1,121	0.3	367	0.3	16,121	1.4
60-64	4.6	594	0.1	214	0.2	11,254	1.0
65 & older	11.7	547	0.1	154	0.1	14,885	1.3
All Ages	100.0*	415,651	100.0	134,018	100.0	1,169,066	100.0*

	MOTOR VEHICLE THEFT		ARSON		DRUNK DRIVING		DRUG ABUSE	
Age Group	Arrests	% of Total	Arrests	% of Total	Arrests	% of Total	Arrests	% of Total
Under 15	8,628	8.2%	4,113	23.9%	522	0.0%	11,819	1.9%
15-19	43,268	41.0	3,749	21.8	132,349	8.2	137,664	22.3
20-24	24,028	22.8	2,799	16.3	404,192	25.1	195,807	31.7
25-29	13,492	12.8	2,174	12.6	324,609	20.1	131,853	21.4
30-34	7,353	7.0	1,429	8.3	229,152	14.2	73,518	11.9
35-39	3,942	3.7	1,049	6.1	163,291	10.1	33,812	5.5
40-44	2,115	2.0	733	4.3	117,023	7.3	15,303	2.5
45-49	1,227	1.2	432	2.5	83,993	5.2	7,449	1.2
50-54	644	0.6	332	1.9	63,533	3.9	4,303	0.7
55-59	421	0.4	188	1.1	45,500	2.8	2,737	0.4
60-64	209	0.2	113	0.7	27,457	1.7	1,758	0.3
65 & Older	187	0.2	92	0.5	21,563	1.3	913	0.1
All Ages	105,514	100.0*	17,203	100.0	1,613,184	100.0*	616,936	100.0*

*Percentage does not add to total because of rounding.

Source: Federal Bureau of Investigation (based on reports from 10,827 agencies with a total population of 200,692,000 in 1983)

I wrote to a number of social service and senior agencies, requesting any specific information they had on criticism of auto insurance by senior drivers. I received no correspondence but did get a few phone calls.

One counselor indicated that "the major concern of most seniors was aging without wrinkles and the next most important concern was not to put a wrinkle in their most important possession — their car."

One counselor asked for advice concerning the handling of automobile claims. Insurance companies generally strive to settle claims as quickly and fairly as possible, and make outstanding claim service their constant goal.

However, if your vehicle is involved in an accident, there are certain things you should know and specific steps that you should take.

If You Have an Accident

1. Immediately after an accident, call the police. Obtain names, drivers' license numbers, addresses, home and work phone numbers, auto license numbers and year, make and model of cars of any other parties involved in the accident. Also, get names, addresses and phone numbers of any witnesses.
2. Call your insurance company agent or company office promptly, even though the accident may appear minor and no one may be visibly injured. Indeed, your insurance policy may require prompt notification. If you do not have their company number, look it up in the telephone directory. Try to have your policy number available to speed confirmation of your coverages.
3. Notify your insurance company of the accident, but this is not necessarily the same as filing a claim of your own. Ask about procedures to follow regarding the filing of any claims with your company or the other party's company.
4. If a claim is to be filed, many companies will begin to process it over the telephone at once; some require written notice. It may consist of filling out a "proof of loss" form, which the company will supply. Information may be asked on time, date, place and circumstances of the accident, the nature of the damage or injury, expenses incurred, and the amount of reimbursement or preparation requested.
5. Keep copies of all pertinent information and correspondence, including the names and dates of your contacts with the insurance company.
6. Most claims are adjusted promptly. Some, however, require longer investigation, but the company would be willing to keep you informed about their status. Do not hesitate to follow up with your company contacts. If you do not receive satisfaction, ask for the area claims-office manager or customer service manager. If they do not provide reasonable replies, contact the company's home office customer service department.
7. If you have a serious complaint that you feel you cannot resolve with the company, there are a number of steps for relief. You may contact your local multi-purpose senior center that has experienced counselors. The insurance industry has a number of state or regional insurance information groups, and their telephone numbers are listed in the yellow pages. If necessary, contact the office of your state insurance department, which regulates all insurance companies.

A New Service

Mature Outlook is the newest addition to the Sears family of companies, created to help those 55 and over to make the most of the best years of their lives. Membership provides a wide variety of savings and benefits, including a possible discount on your auto and homeowners insurance. Also, the member has the opportunity to have a

licensed qualified insurance agent perform a thorough evaluation of your insurance needs, to help determine what insurance coverages are best for you.

Membership in *Mature Outlook* earmarks many benefits from Sears, Allstate, Coldwell Banker and Dean Witter Reynolds, including a quarterly publications, newsletters and self-help aids.

A Testimonial

I confess that I am happy with my auto insurance policy with Allstate Insurance Company. I retired as of March last year and have been insured with them the past 34 years. I now qualify for their special discount — 55 years of age or older and retired. The 10% discount applies to auto, home and motor club membership.

In addition my auto policy qualifies for:

1. The Good Driver Rate discount — for the good driving record of myself and my wife during the past five years.
2. The multiple car discount, which involves more than one vehicle insured under the same policy.
3. The Defense Driving Course discount — by showing proof that I successfully completed a DDC approved by the Illinois Secretary of State. This discount is good for up to three years.

Recommendations

1. Seniors should be "joiners" and "volunteers" of community social-service and health-care agencies, so as to remain active, physically and mentally. Such agencies provide a variety of beneficial automotive, financial, travel, driving and counseling services.
2. State organizations — private and governmental — should initiate and publicize driver improvement programs for Drivers 55+. Seniors—both women and men—should avail themselves of these "refresher" projects. They will thereby maintain a clean driving record, free of traffic arrests and accident involvement claims. This will help assure the continuity of their auto insurance coverages, at the most preferential premium rate. It is essential and beneficial for senior drivers to be very familiar with the states rules of the road. In fact, seniors should provide the leadership and be an excellent example for all drivers, in terms of driving safely at all times.
3. The senior service agencies at the local level, supported by their parent affiliates, should sponsor workshops or seminars in health, housing and *transportation*. These major areas of concern require the senior citizens of both sexes to expend considerable time and funds relative to decisions on insurance coverage.
4. The senior agencies should invite representatives from the national and state insurance trade associations (such as, the Insurance Information Institute) or the state insurance information services, or insurance companies, to participate in discussions.
5. Senior agency counselors, staff and/or volunteers should consult with the auto insurance companies or trade associations, to acquire and circulate current basic insurance information and educational material. Thus, they would be in a position to counsel their senior clients, as they do on federal income tax filings, social security and medicare, financial poverty assistance, and similar problems.

There is a vital need for cooperation and coordination of action programs between the governmental agencies, the senior organizations, the insurance industry and the seniors involved. Today, this need applies to the female senior citizen even to a much

greater extent since women live an average of 7 to 8 years longer than men. Consequently, the women may be driving more miles, in heavier day and night traffic, than in their earlier years.

So, just as we focus attention on the driving capability and responsibility of senior men and women drivers, so must we emphasize the need for financial responsibility.

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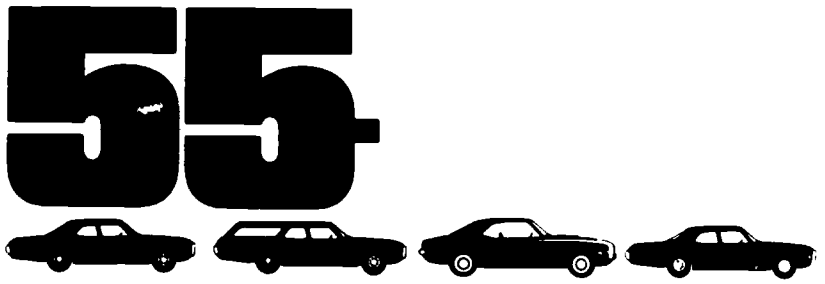

The Driving Situation and Drivers 55-Plus: Comments by a Long-Interested Retired Traffic Engineer

Burton W. Marsh, P.E., is a civil engineer who has devoted a long professional career to highway transportation and traffic safety. He was the first full-time USA city traffic engineer in Pittsburgh. Later, he served in that capacity in Philadelphia. He later became the first director of the Traffic Engineering and Safety Department of the American Automobile Association. He proposed a nation-wide program for the greatly neglected pedestrian, one which took an important part in virtually halving the number of pedestrian deaths between 1937 (15,500) and 1956 (7,950). He was a co-founder of the Professional Institute of Traffic Engineers and its 1932-34 president. He joined in conceiving the AAA Foundation for Traffic Safety and later served a period as executive director. He has long been active in the Transportation Research Board and was a chairman of its executive committee. He has been chairman of national committees on uniform traffic control devices and on traffic laws. He long was chairman of the Technical Committee on Traffic and Safety of the Pan American Highway Congresses. In 1960 he wrote an extensive paper on "Aging and Driving."

Central to our economy and way of life are motor vehicles, highways and driving. Indeed, we are a nation of drivers. In 1983, of every thousand persons of driving age, 846 were licensed drivers (1); In 1983, 23.5 percent of all licensed USA drivers were of age 55 or over (2). That percentage has been growing — in 1963 it was 20.4 percent (3) and will continue to grow appreciably for some years.

In general, public policy is to license qualified persons to drive beginning about age sixteen. Age thereafter is not a major factor until a person becomes a senior driver. Licensing authorities are soundly requiring more checking of qualifications to continue driving as persons reach about age 55 and beyond.

The freedom of mobility and sense of independence which a driver license provides are highly prized by drivers 55 and over. Large proportions if not a majority of them want to continue to drive as long as they remain qualified. For a goodly number of them driving is considered "essential" because of their employment or for other important reasons. Unfortunately, there is a considerable tendency among older drivers to rationalize in their favor those physical and other conditions which call for major driving adjustments (including cessation of driving), many of which are not being suitably made.

Organized society has very important responsibilities regarding older drivers. It should adequately protect the appropriate driving privileges of those drivers as long as

they are qualified — indeed should help them remain qualified by reasonable means. Society also has the duty to protect the public from the failures of persons no longer qualified to drive. In general, society needs to do much more to adequately fulfill both responsibilities. Some such measures are the appropriate responsibility of government; Others should be under the watch of various non-governmental organizations.

In addition, there are numerous practical measures which older drivers themselves can and should take, as personal responsibilities.

Let us consider some specifics in each of these three categories.

Some Things Governments Should Do

In general, government should give much greater attention to the problems and needs of the large and growing numbers of drivers 55 years of age and over, specifically:

1. Conduct and/or stimulate and support research and development as to inadequately evaluated or accepted degrees below "normal" which should be minimum standards or criteria for driver licensing and license renewal. Examples: what corrected visual acuity should be the acceptable minimum? What are the acceptable minimums of night vision? What for distance judgment? What degree of "tunnel vision" should be the acceptable minimum? What time of recovery from glare should be the maximum? What degree of corrected loss of hearing should be acceptable? What maximum reaction times, simple and complex?
2. To varying extents, licensing authorities and others have given study to such matters. Yet the remaining differences in requirements indicate the need for additional consideration.
3. Thoroughly review various laws, regulations and standards to make needed changes in light of diminished abilities of "55-plus" drivers. Example: the Manual on Uniform Traffic Control Devices contains provisions which do not adequately meet needs of elderly drivers, such as lettering sizes on various important signs, including street name signs, most of which are inadequate, especially at night and in other low-light conditions; width and effectiveness of pavement-edge markings especially at night, and even some center lining; signs which do not give "55-plus" drivers sufficient advance warning to react properly; traffic control signal-light effectiveness under some conditions.

   One important matter here and elsewhere is: for which drivers should standards prove adequate? For average drivers? For 70 percent of all drivers? 80 percent? 90 percent? This question has not been suitably dealt with, especially as to the growing number of elderly drivers.
3. Provide and promote guidelines and incentives for continuing programs to inform and educate drivers 55-plus, including specially designed courses on traffic and driving.
4. Institute measures to bring and keep older drivers up-to-date on (1) the significance to them of new research findings, concepts and developments; and on (2) what studies and analyses of accidents, driving practices and violations show which can benefit them.
5. Provide and promote guidelines, data, materials and incentives for non-governmental organizations to run Senior Drivers Service Centers where drivers may get check-ups, up-to-date information, answers to questions on traffic and driving, an understanding of changes in laws, regulations, traffic control devices, and other counseling — all "off the record."
6. Require automobile insurance companies which do business in the jurisdiction to

provide a substantial discount to those seniors who satisfactorily complete an approved course for drivers, as some jurisdictions now do.

7. Periodically re-appriase driver license renewal requirements and procedures as to their effectiveness in dealing with drivers of age 55 and over. For example: how frequently should vision checks be required? driving checks? Continue to develop more objective and equitable bases for disallowing requests for extension of license to drive, and devise acceptable methods of implementation.
8. Analyze the problems and needs of drivers 55 and older in terms of five or ten-year age groups. Recommendations should be patterned in terms of their appropriateness for each age group.

Some Things Interested Non-Governmental Organizations Should Do

In general they should:

1. Do a much better job of informing themselves as to (1) the growing place of the older driver in the overall highway situation, (2) the problems and needs of that age group, and (3) what their organization can and should do.
2. Carefully develop, or preferably join with other organizations in developing a comprehensive SENIOR DRIVER PROGRAM which will operate continually. From among the worthwhile ideas and proposals, a workable number deemed most valuable should be selected for top priority.
3. Keep organization members and staff who are "55-plus" drivers up-to-date as to the significance to them of new research findings, new concepts and developments, and as to what studies and analyses of accidents, driving practices and violations show which can benefit them.
4. Organize or join in organizing SENIOR DRIVERS SERVICE CENTERS WHERE the elderly can go to make self-assessments of their reaction times — both simple and complex, their other physical conditions important to driving, their knowledge of traffic regulations and devices; where they can learn how to self-check if they are following too closely; where they feel free to seek guidance as to driving matters which bother them, always confident that their participation will not adversely affect their driving license or their automobile insurance status.
5. Help promote "55 Alive Mature Driving" courses which have been carefully developed by the American Association of Retired Persons, are generally available, and have proved their value.
6. Develop alone or with other organizations ways of assuring continued attention to and and suitable action concerning problems and needs of older drivers.

   This commendable project of the AAA Foundation for Traffic Safety and Teacher's College of Columbia University should be an important BEGINNING. The Federal Highway Administration has plans, I understand, to study various subjects relating to highways, traffic control devices, etc. The National Safety Council and the American Association of Retired Persons are doing valuable work through, among other things, specialized driving courses. Various insurance companies are providing premium discount incentives to mature drivers who complete approved driving courses. These and other projects show growing interest. There should be some sort of *continuing* joint action. Can a live-wire "sparkplug" mechanism be devised and instituted?
7. Help keep the media informed and stimulated so that the general public will be kept up-to-date and interested.
8. Help "sell" other organizations which should be active or more active.

Some Things Older Drivers Should Do.

There are numerous ways by which persons 55 and over can help themselves remain qualified to drive. One obviously important, though not always easy, way is to do everything reasonable to be healthy, active, friendly and positive-thinking.

In a paper titled "Aging and Driving" (4) are listed twelve items which might be included in a proposed self-help guide which "should be prepared and widely distributed to aging drivers to help assure that they will keep out of trouble in traffic and will enjoy driving." The twelve items, which seem as appropriate today as then, though modified in some cases, are as follows:

1. Get your physician's advice concerning your driving.
2. Be sure the safety features of your car are kept in tip-top condition.
3. Keep yourself in good condition. Drive only when you feel "up to it."
4. Keep on the alert.
5. Take it easy and enjoy your trips, short or long. On long trips, make frequent stops, *well off the roadway.*
6. Plan every trip, short or long, in advance. Be willing to go around congested areas or zones which bother you to drive in.
7. Choose the less used, quieter routes.
8. Keep windshield, headlight lenses, and eyeglasses spotlessly clean. Dirt on any of these interferes more than most people realize with seeing effectively, especially at night.
9. Set up a personal project of periodically updating your traffic knowledge.
10. Join a driver improvement class if your town has such. If it doesn't, urge that one be set up.
11. Have a driving instructor check your driving and make suggestions.
12. Take reaction time and other driver tests as a means of finding out how you rate and what to do to offset any point on which your rating is not "tops."

In recent years, analyses of accident-violation data dealing with aging drivers, discussions with aging drivers, and observations of their driving practices have shown certain actions and conditions which involve trouble fairly often. Such information has resulted in the following suggestions:

Intersections. They are the leading trouble spots. Some correctives: route your trips to use signalized intersections as much as you can — and completely obey signals. When feasible, avoid heavy-traffic periods at intersections. Be sure to come to a full stop at all stop signs, and thereafter be very sure that your actions take full acount of other drivers and pedestrians, visibility-blocking trucks, buses, cars, and so on. If you have any doubt, yield right-of-way.

Left Turns. Avoid having to make them whenever possible — even though you have to go out of your way to do so. You may be surprised at how careful route planning often permits avoiding dangerous left turns. If you must make a left turn, route yourself to do so, ever so carefully, at a signalized intersection or at a light-traffic location. Be sure to signal *amply* in advance.

Heavy Traffic. Arrange trips to avoid heavy traffic periods.

High-Speed Traffic. Avoid it whenever possible.

Following Other Vehicles. Learn and apply a simple procedure to insure against following too closely. The AARP "55 Alive Mature Driving" course recommends an excellent three second following-distance procedure.

Night Driving. Discontinue driving at night when you FIRST realize discomfort or concern about your night driving.

Reaction Time. Make all feasible modifications in your driving when, with increasing age, your reaction times increase appreciably. Reasonably reduce your driving speeds. Avoid both heavy and fast traffic. Increase following distances. Route yourself whenever possible to avoid times when it is necessary to make decisions quickly, especially several consecutive decisions.

Backing. Whenever possible, avoid having to back, even though more advanced trip planning may be necessary. When you must back up, do so very slowly and be doubly sure to take all reasonable safety precautions. Use all three rear-view mirrors.

Long Trips. Break them into reasonable trip-lengths, and take at least hourly rest stops at which you get out of your car and "stretch your legs" for awhile.

Stopping Distances. Learn what stopping distances apply under various conditions and for various speeds. Then *always* drive accordingly.

Lane Changing. Avoid lane-changing whenever you can. When you must change lanes, signal well in advance of your move and change lanes only after you have very thoroughly checked all possible sources of potential trouble.

Alcohol. NEVER drive after drinking.

Right-of-Way. Give alert consideration to right-of-way rules. In any case, BE READY AND WILLING TO YIELD RIGHT-OF-WAY WHEN IN DOUBT, AND EVEN WHEN AN UNFAIR DRIVER "DEMANDS" THE RIGHT-OF-WAY.

Pedestrians. Give special consideration to all pedestrians. Especially act to safeguard children, aged, and handicapped persons.

Overtaking and Passing. Avoid doing so to the maximum extent feasible. When you must do so, be sure you have ample time to complete the maneuver, and signal well in advance.

Freeways. If entering and driving on unusually high-speed freeways is uncomfortable or tension-producing for you, avoid using freeways even though their hazard-rating is much better than that of other roads.

Seat-Shoulder Belts. Always use them, even when driving or riding for short distances, and even for low to moderate-speed driving.

Adverse Driving Conditions. Avoid driving when feasible under such conditions. When you must so drive, step up all reasonable precautionary measures GREATLY.

The above items, while far from covering all effective driving points, include, I believe, the main matters most likely to involve potential trouble for drivers of 55 and over.

How to best attain optimum results as to such points constitutes a challenge which warrants serious consideration.

Indeed, the question of how to attain and continue the motivations needed for optimum progress warrants the best thought and interaction of leading citizens. Admittedly it will not be easy; but the need is great, and results will surely be rewarding.

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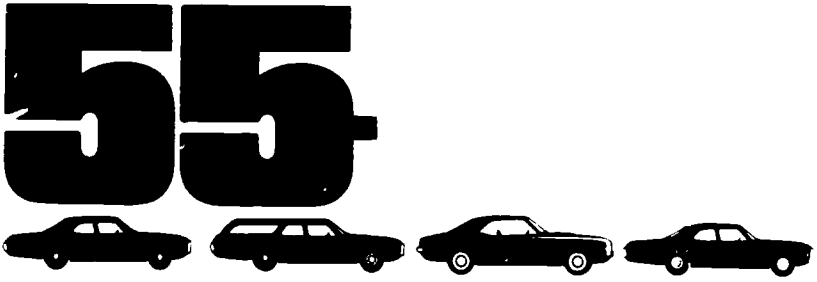
3. A report on drivers licenses by the Office of Planning of the U.S. Bureau of Public Roads by E.M. Cope, Chief, Highway Statistics Division and Ms. A.R. Mundy, Economist. Presented at the American Association of Motor Vehicle Administrators Conference, Des Moines, Iowa, September 24, 1964. Table 11, page 17 of *"139 Million Drivers in 1980."*

4. Page 20 of *"Aging and Driving"* a 1960 paper by Burton W. Marsh presenting a broad analysis of the subject, including numerous age-related facts, trends, etc. and offering a number of suggestions for dealing more effectively with major problems and needs.



Training and Retraining the Older Driver

Ms. Adele M. Milone, National Coordinator of the Safety, Driver Improvement and Tax-Aide Programs of the American Association of Retired Persons (AARP), is responsible for a corps of 24,000 volunteers nationwide. This experience, and that as principal/administrator of school systems spans two decades.

Summary

Drivers 55 and older comprise 24% of the driving population.[1] It is estimated that by the year 2030 one out of every five persons will be over 65.[2] Many older persons suffer from isolation and appreciate opportunities to increase their mobility. It has been said that when the elderly stop driving, they stop going out altogether. However, as drivers they need greater reassurance than others in traveling and in reacting to emergency road situations.

This paper will discuss the characteristics and needs of older drivers and suggest methods for preparing them to deal with those age-related changes which lead to problems of perception and reaction. It will discuss the need for retraining in traffic maneuvers, adverse driving conditions, the rules of the road, and local driving hazards.

Characteristics of the Older Driver

Aging means changing. Both are inevitable. Physiological and psychological changes occur at different times in different people. These age-related changes, common to us all, have an effect on older persons who wish to retain their mobility and independence by continuing to operate a motor vehicle.

Driving is basically a decision-making process which is dependent on perceptions and judgements. Since it is commonly accepted that between 85%-90% of the perceptions in driving are visual, then driving and visual perception are closely related.

To drive safely demands that the driver not only see objects in his area of travel, but also understand their implication for safety. This ability to recognize and interpret what is seen is called perception. Perceptive drivers readily search out those clues important in a traffic situation and adjust their driving accordingly.

Perceiving traffic situations is a process which involves both our brain and our senses. The brain must interpret the sensory data or information received, but it can interpret and analyze only what we are aware of. Since we can't perceive all that we observe, perception is a selective process.

[1] Older Driver Retraining Report, March 1980 – September 1982

[2] Population Bulletin, January 1981, Population Reference Bureau

Research tells us that the driver age 55 and over has a problem both in ignoring meaningless information and in correctly identifying meaningful clues. Inattention to the driving task and lack of concentration are the primary reasons for these problems. As we grow older, we need more time to perceive a situation, organize the information gathered, and react. It is extremely important to concentrate on the driving task at all times and be alert for those clues which are important to any given traffic situation.

Changes in vision and hearing and limitations in muscular coordination affect one's ability to operate a motor vehicle safely. The likelihood of being involved in an accident — and injured — increases with age. Recent statistics indicate that, per miles driven, the older driver is involved in, and often responsible for, a greater number of accidents than drivers in their middle years. The chart in Appendix 1 shows that accidents per 100,000 miles increase sharply for both men and women after age 60.

Older drivers experience a decline in visual acuity, glare resistance, color perception and intensity, focusing ability and peripheral vision. Recovering from the effects of glare and adjusting to light conditions require more time. On the road, these debilitations can increase the potential for accidents. Traffic patterns, road signs, weather conditions — all the common hazards encountered in the driving environment — are compounded. Results of performance in a visual perception and orientation test are diagramed in Appendix 2.

Because of hearing changes, the older driver is less sensitive to the high-pitched sounds of emergency vehicles. Often, other sounds, such as railroad crossing warnings and other automobile horns, are muted. With car windows up and radios on, the older driver is again at a disadvantage in assessing potentially dangerous situations.

Frequently he experiences a restriction of body movements due to health problems, alcohol and/or medication. As a result, reaction to stimuli may be slower. Complex head, arm and leg movements tend to be limited. The charts in Appendices 3 and 4 show the effects of alcohol and certain medications on driving.

Cognitive changes are also an accompaniment to aging. While long-term memory loss and learning skills seem not to deteriorate, a decline in short-term memory causes problems, especially in organizing information coming from a variety of sources. Decision making in traffic is less acute. There is some decline in the ability to estimate the passage of time and to judge the speed of other motor vehicles. The traffic environment may produce too many cues at one time, thus causing confusion or erratic driving behavior.

With these characteristics in mind, the instructor of older persons needs to employ methods of teaching which encourage learning and deal effectively with age-related changes.

Principles of Adult Learning

We are never too old to learn. Most people of average health continue to learn throughout life and can expect to maintain or even increase their level of performance with advancing age. While the sharpest decline in intelligence seems to occur about age 62, the adult student enters the learning environment with a great deal of internal motivation, especially if what he is to learn is immediately useful.

Adult learners tend to be problem centered. The abilty to learn remains essentially unimpaired throughout life, yet too often the environment of the elderly is socially and intellectually impoverished. The extent of meaningful learning can be influenced by creating a positive atmosphere prior to the learning situation.

Whoever teaches a class of adults must keep in mind that they have more assets than limitations, but that both must be taken into account. Adult learners have a

formed outlook on life, family responsibilities, a wealth of past experiences, and special training, interests or expertise. The success of a class for adults is contingent upon the ability to make good use of this experience. Group learning can then be a joyful experience, one in which learning takes place rapidly.

Adult education has to be concerned with interrelations in a group setting as well as with changes in the individuals themselves. Those methods and techniques which involve the individual most deeply in self-directed inquiry seem to produce the greatest learning. Set lectures have a place, but tend to "miss the boat" for adult learners. Discussion generally produces positive responses. We learn best not only by interaction with an instructor, but by cooperating in the planned activity... sometimes listening, sometimes talking, sometimes performing. Adults have been through many years of learning and building habitual attitudes. It is not to be expected that these attitudes can be modified or unlearned easily. At the same time, if there is no modification, the educational experience has been wasted. The most desirable learning situation for adults includes active involvement.

Methods of Response

Older adults bring a wealth of experience to the learning situation. They also bring motivation to learn, enhanced by a desire to accommodate their needs, chiefly the intense need to remain independent and mobile.

Most older persons are interested in their health and safety and recognize their limitations. Once they acknowledge age-related changes, they seek ways to compensate for their situation in order to live more fruitful, independent lives. Programs which are designed to address the special needs of older drivers alert them to the necessity of a keen awareness of the critical stimuli in the traffic environment.

Recognizing these facts, a driver improvement program for older adults can teach methods of compensating for the deficits brought about by aging. Alerting them to normal age-related problems and reviewing with them the principles of safe-driving will enhance their self-esteem and help keep them on the road longer, driving more safely.

Driver improvement programs are offered in virtually every state. Few, however, present separate programs for drivers over 55. Since 1962, several specialized programs have been offered around the country. But these have been localized. As of 1982, only 12 are still in operation.[3] These programs have been oriented to the classroom rather than to behind-the-wheel instruction. Information is disseminated through a variety of techniques: lecture, films, group discussions, presentations by professionals in traffic safety, and the like. No written tests are administered. Although these programs help to alleviate some of the problems faced by senior drivers, they do not reach a significant proportion of them. Many more older drivers are not having their needs met.

55 Alive/Mature Driving

In 1979, the American Association of Retired Persons designed the first nationwide course exclusively for persons 55 and older. 55 ALIVE/MATURE DRIVING followed 16 years of AARP involvement in safety and driver improvement programs. These programs have helped older motorists throughout the country improve their driving skills and prevent accidents. Applying the principles of adult learning, 55 ALIVE is conducted by trained, older volunteers, themselves "graduates" of the program, through the sponsorship of local organizations. It was created to assist older adults achieve many years of safe, independent, accident-free driving. In the period 1979-84 it had more than 250,000 graduates.

[3] Older Driver Retraining Report. (See 1)

55 ALIVE takes into consideration both the normal, age-related physical changes and the advances in educational curriculums which enable drivers to compensate for these changes. Course material is based on research to determine the needs of older drivers in order to update their knowledge and driving skills. Most importantly, the six-session course provides opportunities for participants to identify individual problem areas and gain information needed to improve their driving behavior.

Classes are conducted over a minimum two-day period, arranged through local community groups or industry. Considerable use is made of slides, tapes and round-table discussion groups. To maximize participation, courses usually include 18-25 persons. A minimum fee per person helps offset the cost of course material and provides some travel reimbursement for the voluntary instructors.

55 ALIVE/MATURE DRIVING is available in 49 states and the District of Columbia. Program content includes: review of the characteristics and accident experiences of older drivers, physical changes that relate to driving performances, common hazards encountered, rules of the road, freeway driving, effects of alcohol and medication on driving, emergency driving techniques, adverse driving conditions, characteristics of other road-users, local problems, auto maintenance, license renewal, and a checklist of options available in purchasing automobile insurance.

The 55 ALIVE/MATURE DRIVING program has gained incomparable recognition in record time. The course was subjected by the United States Department of Transportation to one of the most penetrating independent evaluations of any driver education curriculum available today. The evaluation involved thousands of drivers and showed positive results in increase of knowledge, reduction of violations and prevention of accidents. It has brought the needs of the older driver to national recognition and has to date served as the basis for legislation to attain mandated insurance discounts on auto premiums for graduates in 14 states. 55 ALIVE/MATURE DRIVING has achieved national prominence for the volunteer in safe-driving programs.

Conclusion

It is apparent that a significant segment of the population is not having its needs met. Driver improvement programs of a generic nature do not meet the criteria. The alternatives for older persons are reliance on relatives and friends, public transportation, or vehicles for hire. All of these fall short of accomplishing the goal of independence and mobility for nearly 1/4 of our population.

A re-training program is not the end of driver education; it's a beginning. The sun does not need to set on the older person's driving skills, abilities and attitudes. It rises through retraining, practice and the application of the material learned.

More programs need to address the specific problems discussed. Training or re-training improves capabilities, leading to the reduction of accidents and making the nation's roadways safer. Local governments, service organizations, and community businesses can play a significant role in addressing this area of concern through funding, through public awareness seminars and course sponsorship. But they need to be alerted to the need for and ramifications of driver improvement programs for older motorists and the value of providing and/or sponsoring such programs. Through their participation more older motorists can be reached, programs expanded, and the goals of independence and mobility for the older driver achieved.

Appendices

A-1 Page 39 — Proceedings — *National Conference on the Aging Driver,* E. Klebel, Ph.D. (Overhead transparencies)

CHART 1

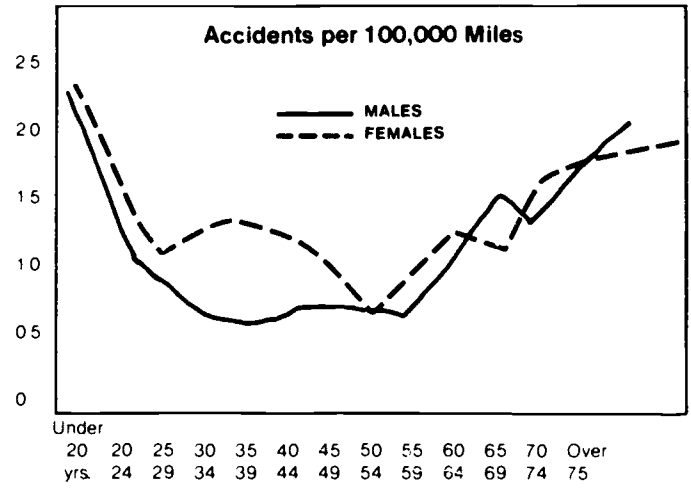
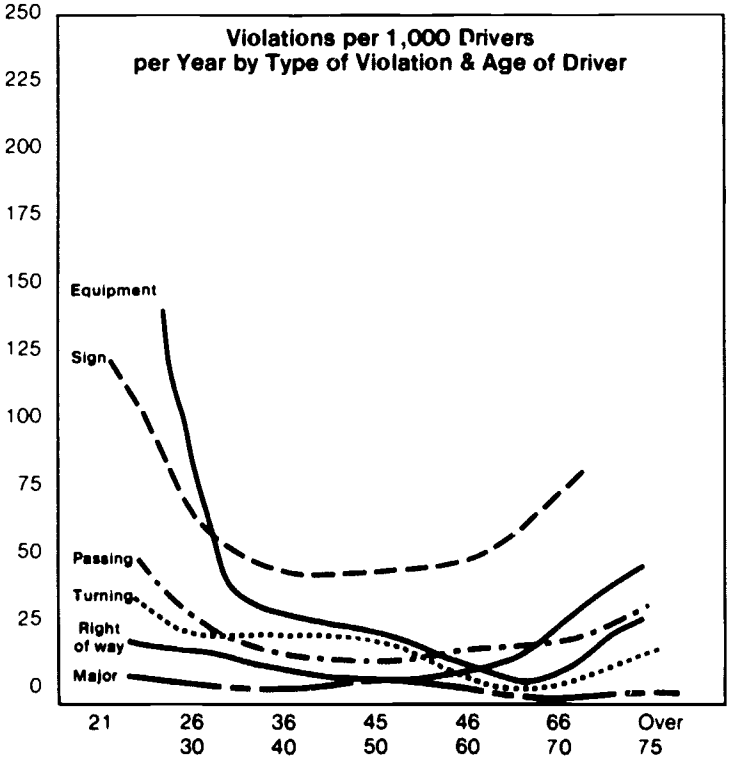
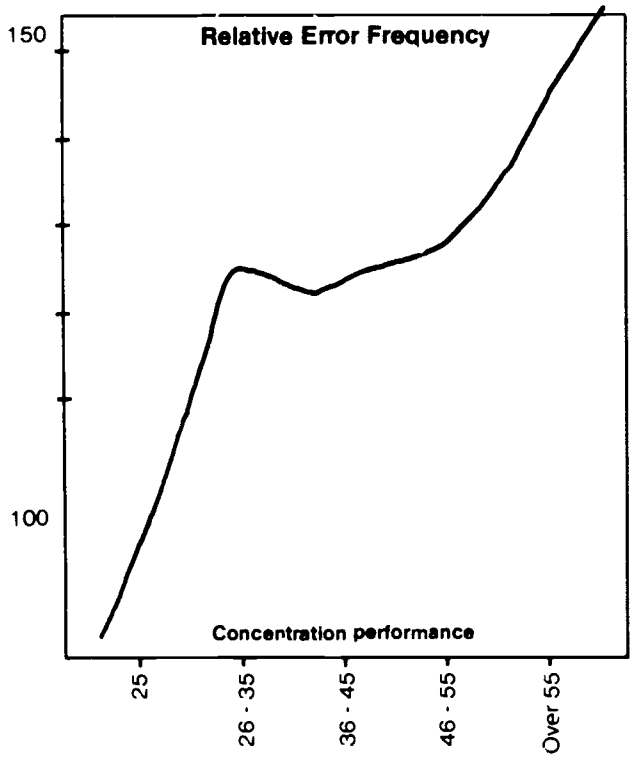


CHART 2



A-2 Page 42 (Fig. 6) — *National Conference on the Aging Driver,* E. Klebel, Ph.D.



A-3 Page 2-34 — Instructor's Manual, 55 ALIVE/MATURE DRIVING, Edition II

Body Weight And Alcohol Consumption Chart

Weight	Drinks (Two-Hour Period) 1½ ozs. 80 Liquor or 12 Ozs. Beer or 5 ozs. Wine											
100	1	2	3	4	5	6	7	8	9	10	11	12
120	1	2	3	4	5	6	7	8	9	10	11	12
140	1	2	3	4	5	6	7	8	9	10	11	12
160	1	2	3	4	5	6	7	8	9	10	11	12
180	1	2	3	4	5	6	7	8	9	10	11	12
200	1	2	3	4	5	6	7	8	9	10	11	12
220	1	2	3	4	5	6	7	8	9	10	11	12
240	1	2	3	4	5	6	7	8	9	10	11	12
	CAUTION BAC TO 05			DRIVING IMPAIRED 05 09						LEGALLY DRUNK 10 & UP		

Figures are averages. Alcohol effect may vary with each individual.

A-4 Page 2-25 — Instructor's Manual, 55 ALIVE/MATURE DRIVING, Edition II

PHYSICAL CHANGES
55/Alive Mature Driving Medication Chart

Chronic physiological condition	Type of Medication	Potential side effects on driving
Arthritis and rheumatism	Analgesics	Drowsiness, inability to concentrate, ringing in ears
Allergies	Antihistimines	Drowsiness, confusion, reduced reaction time
Common cold	Antihistimines	Drowsiness, blurred vision, dizziness
Diabetes	Anti-diabetics	Drowsiness, inability to concentrate
Hypertension	Antihypertensive	Drowsiness, dizziness, blurred vision
Weight control	Stimulants	False feeling of alertness, overexcitability
Emotional states		
Anxiety	Sedatives	Drowsiness, staggering, blurred vision
Depression	Stimulants	Overexcitability, false sense of alertness, dizziness
Fatigue	Stimulants	Overexcitability, false sense of alertness

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3. Grotelueschen, Arden D., *Adult Education;* "Introductory Material Structure and Prior Knowledge Effects on Adult Learning"; Vol. XXXIX, No. 2, 1979
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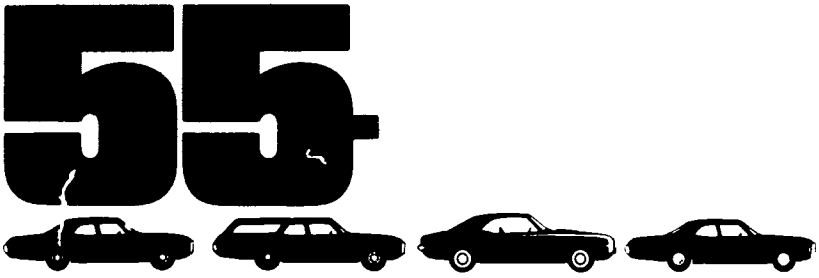


Impressions: An Amateur Looks At Senior Drivers

Before his retirement in 1979 Clifford C. Nelson was President of The American Assembly, a public affairs forum at Columbia University which regularly publishes books and reports on current problems and organizes discussion groups at colleges and universities across the nation and abroad. Prior to joining the Assembly in 1954 he taught English at Columbia. At present he is director of the Public Affairs Committee, Inc., a nonprofit educational organization founded in 1935 to issue concise and interesting pamphlets on a wide range of economic and social problems.

"We would like your intuitive and candid impressions of the problems and needs of drivers 55-plus and of what might be done about them."

—Instructions from Chairman

My father remembers when one did not need a license to drive a car. "In many parts of the country," he once said, "any ten-year-old who was able to get into the driver's seat and start the flivver up was a driver, and that was that." We are speaking of the second decade of this century. The total population of the United States at the Census of 1910 was a bit under 92 million. Only about 181,000 automobiles were made that year, and few states required even auto registration, let alone driver registration.

By the early thirties, when I was in college and the population was around 123 million, auto registration was nationwide (and had been since 1921), and driver licensing was almost everywhere a requirement — but not too tough to pass. I recall getting a permit on the presentation of my birth certificate. Three casual lessons later — on the first, I had gone through a hedge, on the second over a curb — I presented myself all alone in my forty-dollar Model A at the local motor vehicle bureau.

I passed the written test — just. On the road test, I went through a stop sign and stalled three times trying to go upward from a standing position on a hill. I capped this brilliant performance with a skillful parallel parking maneuver, backing into a space between two simulated cars (4 steel barrels equals one car) parked one behind the other, not however, without giving a good solid whack to the "car" in the rear. From this incident may have originated the cartoon in which the inexperienced young driver says, "The thing I hate about parallel parking is the crash."

The licensing inspector, highly amused at all this, finally said, "Well, if you're passing in college, you must know *something*." He signed the chit. I got the license. I then learned to drive. This is a true story.

I need not point out that those relatively uncomplicated days are gone, never to return. In 1982, almost fifty years after I got my license, we had more than 145 million

licensed drivers, almost 160 million registered cars, trucks and buses, consuming 115-1/2 billion gallons of gas annually in a network of countless streets and highways, and tightened traffic controls.

More Regulation Coming

The outlook is for more of the same. For it is plain to whoever cares to look at the population of this nation that it is still growing, whatever the rate of growth. The 1980 Census put us at 226-1/2 million. Since man first walked the earth, it has been true that increased numbers lead to increased regulation. In crowded conditions, the alternative to regulation is anarchy. The more people, the more controls they have to devise for themselves in the name of good order. Failing that, the controls are placed upon them. In democracies, most controls come from a process that Dean Acheson (I believe it was he) once called "percolation": they are the result of ideas bubbling up and laws filtering down. We sometimes call it self-regulation. It usually takes longer than government by authoritative order only. In totalitarian societies there is little bubbling. We turn to China to note the primacy of law by edict over law through general consent.

Seniors Not Exempt — We are talking, however, about the United States and "55-plus" driving. It seems to me that whatever one's views for or against it, the prospect is for more regulation of senior driving — to save some of the older drivers from themselves and from other drivers, and at the same time protect the rest of the population from the seniors.

I have the impression that on balance, we Americans would prefer to place our trust in senior drivers themselves, making each one his own "court of first resort." Every senior, knowing what his car needed for public safety and his own would take care that things were in tip-top shape. Every senior, when he felt he was beginning to lose control of his faculties, would undertake to make appropriate modifications in his driving practices (e.g., drive less at night or in bad weather, go to the doctor, install special equipment and so on); and when he felt he had lost too many of his driving wits would turn himself in, so-to-speak. This, in fact, I hold to be true for a myriad of older drivers now licensed for the road.

Only in the best of all possible worlds, however, can we operate entirely on such an assumption. As it is, some-many-more-most of us aging drivers are reluctant to admit we are "losing it." A number of years ago an elderly associate of mine, in a mood of candor on the second drink, deplored the sad spectacle of a friend who, he felt, "stayed too long on the job." "Promise," he said to me, "that if ever you see me begin to fall apart you will do me the favor to say so right to my face." After some deprecation, I promised.

About five years later I kept the promise on the pre-luncheon drink (he was down to ginger ale.) "Do you remember once asking me to tell you when you should think of quitting?" I said.

"I certainly do," he replied. "I still mean it. When you think I am no longer as good as I am now, don't hesitate to confront me with the fact."

Many of us feel that everybody is crumbling except us. We need to recall the wisdom of John Donne: "Never send to know for whom the bell tolls; it tolls for thee."

Elders Can Compensate — But let us regain some balance, and first of all, say the obvious. Some begin to lose it sooner than others. Senility is not calendared the same for all. And how cruel it would be of society to impose a specific age for taking the car keys from seniors. An invidious business, indeed.

As I see them, most seniors can read the portents of impairment and take it upon themselves to alter their driving habits to conform to their abilities. Moreover, declining powers are often compensated for elsewhere, as in the exercise of caution and in

personal management. In any case, we can be sure that senior citizens, as one of America's largest pressure groups, are going to fight tooth and nail for what they consider to be a "fair shake" in any regulatory process.

Like everybody else, of course, I sometimes worry about elderly drivers, and occasionally I worry about my own elderly self behind the wheel. One day I will tool around town with all the assurance of a younger man. On another day, on the highway, I might fight off drowsiness and even begin to drift out of my lane. At the same time, I and many like me, I daresay, take pride in habits we have acquired since age 55: e.g., more patience, more courtesy and consideration of the road. We wave other drivers to come in ahead of us, and to pedestrians to cross in front. More so than when we were young, on the way up and in a hurry. In part, to be candid, we have more liberty to be n: .. In other part, to be nasty, we are nice because we do not react quickly enough to beat out the other drivers and the walkers. In many countries, not excluding this one, the best driver is he who gets there first.

Elders Can Learn — Just a few months ago a neighbor about my age learned by force of circumstances a new way to back out of his drive. For years he had gone by the book, which says in effect to "place your right arm on the back of the seat and turn around so that you can look directly through the rear window. Do not depend on your mirrors." As he aged, he found this practice to be a pain in the neck, in both fact and figure. How does he do it now?

"Why," he grinned, "it's all done with mirrors. And I learned at the Medicare age, too. Old boys can learn new tricks."

Last March my wife and I rented a car at the Phoenix Airport. After greeting us and before running back to work, my daughter gave us the quickest of briefings on Phoenix traffic. "Keep uppermost in your mind two things. First, those doublelined, orange-colored areas in the middle of the larger streets are for making left turns. They are not, regular driving lanes. Get in and get out fast, and look well ahead of you. Somebody may be coming at you from the other direction, looking to make his own left turn.

"Second, on making left turns at intersections without left-turn signals *do not* forget that only the first two cars are supposed to turn left on orange. So be alert. Good luck, and I'll see you later."

"Yes, if we come through," I said to myself. So we went out into the thick of it, and over the next weeks drove over a thousand miles without incident (and only one close shave) in what to us was and still is one of America s speediest and most puzzling traffic systems — which incidentally in spite of all, somehow left the impression of being well-ordered. Septuagenarians can and do learn new things. Some "octo's", too. "Nona's"? Well . . .

Educable though they may be, oldsters also make mistakes. I was on my way to the post office to mail to Dr. Malfetti a letter of acceptance to join this panel, when suddenly, as they say, I ran a red light. The officer who stopped me was skeptical of my description of the contents of the letter. I leave it to you as to how it came out.

Action Based On Concensus — Self-imposed discipline. Yes, all we can get, by all means at one's command. It costs very little, and we all profit; yet of itself individual action cannot maintain and improve the caliber of senior driving. To give a seemingly minor but highly significant example of deviation from the norm, it can do very little about the older person who is sure he has moved his stick shift into reverse only to find himself lurching forward into a rear bumper, and in humiliation seeing the other driver shake his head disapprovingly. Imagine that on the rim of the Grand Canyon. Solving the problems of the 55-plus driver is the job of many minds, yes and hands, in this instance, engineering hands.

What Shall be Done?

But what action? That, I take it, is one of the challenges. As a senior who by his wits and some of the grace of God is still a certified driver, I have some "impressions" of what might be done "to meet the needs of 55-plus drivers." I have no statistics to prove these impressions, nothing but a number of tentative notions and a few convictions based on experience. I like to think, however, that experience counts if enough people can be counted who have shared it. Wherefore, I am brash enough to suggest the following:

Physical Check-Up — Need we say that it is the duty of every senior citizen, for his own well-being if for nothing else, to have an annual physical examination? To satisfy licensing requirements, however, I believe that seniors at some point in their seniority and at stated intervals thereafter should have a physical for driving purposes. It is not necessary to be looked at every year by every machine ever invented, a costly procedure. On the contrary, each machine in its turn, as determined by the attending physicians. Nor is it essential to good "driving health" to be turned inside out, as it were, and given complete nettoyage. Common sense medical doctors can and will outline certain basic procedures that need not be costly. I have no competence to say with confidence what these should be, but would be surprised if they did not include such routines as heart test, blood pressure, and blood tests.

Eyes — If I had my way, an important part of the physical would be a thoroughgoing eye examination. How often? I do not know for sure, but I think that, subject to modification by an opthalmologist, I would set a general standard whereby the intervals between eye examinations would decrease as age increased. On the license of every senior driver would be recorded: (a) any deviation from the legally accepted norm, and (b) the prescribed corrective for holding the license. On this I would come down hard.

Hearing — There could, should, and if I were in charge, would be periodic auditory examinations, and minimum standards set for those with and without hearing aids. Hearing aid requirements, if any, would be encoded on the license.

Driving alongside a big, noisy truck on a two-lane road, especially in a confined space such as a tunnel (try the Holland Tunnel, New Jersey to New York City) is for a new driver an unnerving experience, one that may or may not disappear with maturity and reappear with seniority. To drive without noise would be a state of bliss. For years we were urged by motor vehicle officials and public service advertising to "rely on your brakes instead of your horn." Then we were told that "noise is a form of pollution." Moreover we know that people who begin to lose their hearing rely on their eyes to compensate; and *a priori* I have the impression they drive just as well as those with better hearing.

Still, I sometimes ask whether we give enough attention to hearing in our licensing tests. After all, automobile horns are there to give notice (a tap) and warning (a blast), and we should be able to hear them. Many a driver has been spared injury or death by hearing a car before he could see it. Car radios will not interfere if the volume is controlled. Until I am assured however, that they do not constitute a menace, I shall continue to be startled by the sight of any driver, especially an older driver, with radio head phones, and to have grave doubts about them, and about him.

Smell — What about the olfactory sense? It would do some good, I suppose, to be able to smell gasoline or other foul odors coming out of the heater, or God knows what from God knows where. Drivers' manuals tell us not to sit in a car with the motor running unless a window is open; and we are warned that fumes from a leaky exhaust can cause death "in a very short time."

I have told my maintenance regulars that my heater doesn't smell right to me. "I don't smell anything," says the ancient service manager. So what to do? I put the question because surely I cannot be the only senior who "smells things," just as the

service manager is not the one who doesn't. Does anyone sense a requirement in this? I have queried many a professional, and have invariably had to settle for the standard "low priority" reply.

Head — Every 55-plus driver should, quite literally, have his head examined regularly (how regularly?) to determine the extent to which he can turn it left and right, up and down. True, mirrors are being improved rapidly, and the problem may soon be more manageable. Some say it is already solved. But whether it is or isn't solved, some time will elapse before every car on the road has been engineered for blind spots. Until then, I for one will continue to follow the drivers' manuals which tell me that the only way you can see a car at one of the "blind spots" right and left is "by turning your head and looking" — and will continue to hope that stiff necks will soon be corrected somehow, or removed from the driving scene.

Finally, with regard to the setting of physical standards for each age group, I repeat that the senior population is growing, not shrinking. Sooner or later, a point will be reached at which an elderly person must have his license lifted, if he has not already turned it in, through the dictates of common sense. Finding that point is case-by-case, each individual in turn. When an acceptable level of competence can no longer be maintained, the cut-off point will have been reached. Any other way, I submit, is unthinkable.

Refresher Course

Speaking of examinations, I wonder whether others share my view that at stated intervals senior drivers should present themselves for refresher courses — briefings on "what's the latest what" in the traffic world — i.e., new laws, review of important current laws, new traffic signs and street markings, the latest on seat belts, and so on.

I believe, from personal participation in one, that such courses would do much good. Take, for example, the subject of warning signs. Some can be troublesome if not seen often enough to remain familiar. The pictograph for the message *Divided Highway Ends Ahead* appears to me enough like the one for *Divided Highway Begins Ahead* to be confusing if it is come upon suddenly, especially if it has been seldom seen. As often as I have had the sign *Right Lane Ends Ahead* interpreted for me, I tend to forget it. I just slow down.

Signs can also be introduced to the public with so little advance notice that one scarcely knows they exist. Recently I saw in a driver's manual a colored decal designed for display on vehicles traveling at less than 25 m.p.h. I may have laid eyes on it before, but if so, I paid no attention to it or soon forgot. It is not the intention of motor vehicle bureaus to restrict the announcement of an innovation. Far from it. But even in the best of circumstances it takes time for the news to reach every driver. And some, I venture to say, don't get at all. Others just forget. Updating is to everybody's advantage.

Suggestions from Seniors — Refresher courses would also provide an opportunity for senior drivers to say what is on their minds, to tell authorities what they think might be helpful to themselves and others. To exemplify, the location and readability of street and directional signs may vary considerably around the nation, I suspect. To drive uninstructed into New York City for the first time can be an initiation into chaos. There *are* signs, and some are well placed; but with regard to other signs he who hesitates to figure them out and act quickly can be almost hopelessly lost and, for example, heading for Manhattan, find himself on the George Washington Bridge to New Jersey. And one can be pinched in New York City for taking a right turn on red in the absence of a permission sign.

Even cities with generally good identification and directional signs can at times be puzzling. In one city, the signs bearing the names of main streets and crossroads are at

the intersections and plain to see — during the day, that is. I have heard drivers say that at night the only way a newcomer can tell, say Elm Street from Old Chisholm Trail, is to "guesstimate" by the size of the cluster of letters. If the signs have about the same number of letters, too bad: wrong turn.

The refresher course might be as good a location as any for seniors to blow off their own steam of complaint and resentment, as well as to take some heat themselves. The elderly don't like to be patronized; they resent encroachments on their freedom; they are appalled at some of the wild driving of the young when under cups. They should have an opportunity to say so. And although the course is not to be thought of as a substitute for a full-scale public hearing on the condition of streets and highways, a stout blast from a large group of elders about potholes and other deterioration is quite in order, I suggest. It goes without saying that a chorus of seniors will be given a hearing by automakers. Refresher courses, if there are enough of them, could be individual polling places for a national senior drivers' poll.

At the same time, seniors, like everybody else, should be told "like it is." It is a disservice to all in the community to withhold from senior citizens the observation that even patient people can sometimes lose their "cool" over the driver 55-plus who holds doggedly to a speed of 40-minus in the center lane. You will have your own stories of senior driving negligence.

Ventilation of these sorts of things in a good session of give-and-take can stir up a breeze which, if there is enough of it, can create a climate of opinion.

Paying — These courses should be paid for privately. If current deficits continue to rise it will not be long before that old sign which politicans like to display on their desks (*The Buck Stops Here*) may become *The Buck From Here Has Stopped*. Besides, is not the American driving tradition one of "paying as you go" for a privilege?

Let me pause here for a qualifying and dissenting view touching on the question of privilege vs. right. Driving, I assert, is not a birthright. And frankly I do not understand why the question of driving *right* vs. driving *privilege* is raised at all. We hear too much about "rights" these days, wherever we turn. The Rights of Parents, The Rights of Children. The right to do this, and its obverse, the right *not* to do that. Not all actions of human beings require statutory recognition or even documentation. Life would lose its flavor and zest if everything we took for granted had to be made explicit in law. Many of the "rights" we hear demanded can scarcely be taken seriously. There is as much to be said for the Right to Go to the Toilet as for the Right to be Angry (at some failed social demand), the like of which I have seen brazenly put forth. Both rights are responses to certain recurring situations and need not be carved into stone. In comparison with our sacred Bill of Rights in the Constitution, the "right to sing the blues" holds up better than the "right" of an incapacitated person to drive a car, etc., "Good lord, deliver us."

Driving, then, is a privilege, a concession granted, and subject to removal; and all who have it should pay something for it, older folks not exempted. It is a mistake to think everything for the retired should have a discount mark attached to it. The pay-off to seniors vis-a-vis licensing costs could come possibly in some sort of reduction in insurance and a special reduction of licensing rates for those who keep current in all phases of driving requirements and stay out of trouble. Some insurers have lower rates for seniors who will drive only in the daylight. Others give credit for "courses."

Private enterprise now gives to affairs *pro bono publico*. Perhaps one day all insurance companies and other businesses related to the automobile except, say, towing companies and undertakers, will join together to underwrite as a public service the preventive insurance of refresher courses.

Behind the Wheel

Road Tests — Along with briefing sessions and refresher courses why not an

occasional on-the-road, behind-the-wheel test, or simulator test, or a combination thereof. We could start with a pilot project or two, if we haven't already done so. We might be surprised. Last month, in a shopping center, I watched a gray-haired man, cool as a cucumber, straddle a white lane-marking line as he nudged his wheels into the curb. I concluded that he must have needed two parking spaces. In any event he had them. On another occasion I saw a grandmotherly type pull in to parallel park at the curb in front of a market. At least she thought she pulled in, but I think she missed by about three feet. "Poor old girl," thought I. Then I recalled the sight on film of, if I remember, Woody Allen smiling tolerantly at a young Diane Keaton, who had just stopped in front of a hotel. "That's okay," he said to her. "We can walk to the curb."

We are all in this together, young and old. Every now and then I think one group is neither better nor worse than the other: different in some things, alike in some.

Reaction Time — It must be admitted, however, that young and old can be strikingly different in one of the most important aspects — maybe *the* most important aspect — of driving. I speak of reaction time. It is difficult for an older person to know when his responses to demands of the driving task have slowed down. If I myself were asked today to compare my reaction time to sudden changes in a driving situation with my timing of five years ago, I would almost certainly say "about the same." The fact is, I haven't the faintest idea.

The testing of the reaction of seniors to the stimuli reaching them behind the wheel must not be overlooked. My impression is that the appropriate place for this test is in the car itself or in a simulator. It would eliminate a lot of the grief of accidents and deaths.

Field of Vision — Perhaps the test behind the wheel would be as good a time and place as any other to add a test for depth and height perception in the field of vision. I believe the importance of the concept of distance is self evident. Good distance judgment is essential for knowing how far you are from another car. How unsettling it is to be treated to the apparition of a head looking not over the wheel but through it. Whoever cannot be easily propped and cushioned one way or another to see "full field" ahead should be dropped from the driving rolls. (This is entirely apart from the question of the severely and permanently handicapped person with this and other deficiencies who has been driving for years with a special license in a special automobile.)

Car Equipment — I suggest that the automobile of every driver and especially every senior driver, should have a rear-view washer-wiper defroster installed as standard equipment. For reasons that I take to be evident the car should also have a border of glare-proof glass on the windshield and frontside windows. And perhaps better blinds than most of us now fuss over. But the best I can say for the deeply tinted, "black" window glass, usually on big cars, is that it is close to being useless, except to shield movie stars, gangsters and others like them from public curiosity. Defoggers/defrosters for frontside windows can also be useful, although as one observer put it wryly, "When I consider the cost, I'm not sure a hankie won't do just as well." It won't.

And I ask why we do not insist that the auto of every senior driver have a rear-view mirror on the outside right front as standard equipment. It is bothersome enough to have that damnable blind spot to the right rear. The situation doesn't improve with our being warned by manual to "Check quickly: do not take your eyes off the road for more than an instant. The vehicle ahead of you could stop suddenly when you are checking over your shoulder."

Still, not every accident is attributable to the blind spot. I have an impression, said by a few friends to be nothing more, that drivers are too casual about the right side. Few in their senses will move to the left without looking into the left mirror or glancing to the left rear. Not necessarily to the right, however. If I theorize correctly, quite a few

drivers, having been drilled to "keep to the right except when passing," have a tendency to drift carelessly to the right without signaling, on the subconscious notion that because there has not been a right rear-view mirror, there need not be any. They take the lane as a given. Somehow it "belongs" to them.

This is conjecture, to be sure. And as the old English used to say of myth, "He that will trow it, trow it: he that will not, lefe." Nevertheless, I have twice been in accidents with good drivers—if university professors are good drivers—who took the right lane for granted and thought nothing of moving into it—just before the crash. "What could I have done wrong? That fellow was coming much too fast, I thought." Rear-view mirrors may not eliminate blind spots. Some people are sure they will. Some say they will but are difficult to use and therefore not worth it. That is an absurd attitude. Let us *learn* to use them. They can be positive additions to safer driving.

The miracle mirror, which apparently gives a 180-degree view to the rear, is on the market and coming along. We shall see what we shall see. Meanwhile, why not use what is available but often ignored.

Car Inspection — I know few seniors who do not take care of their cars. The best second-hand buy in America, we have all heard, is the ten-year-old car with ridiculously low mileage, owned by two ancient ladies recently deceased who had it checked by a mechanic every spring and fall, who polished it every Saturday, drove it only to church, and stayed home when it rained. More humorous than typical. But I think it makes the point: tender loving care helps prolong the life of an automobile and possibly of its owner. Statutory inspection is a means toward this end.

Inspection laws vary by state. Some have annual, some biennial check of tires, wheel alignment, brakes, horn and lights. Emissions tests are here. One state has a compulsory annual emissions test but requires a mechanical inspection only if the car is more than ten years old *and* its ownership is transferred; or if it is an out-of-state car whose owner is a newcomer taking up residence.

Lacking information on senior driver experience with or without auto inspection, one ought to be careful about making sweeping recommendations and to wait until seeing some sort of score on accidents with vs. accidents without inspection. In the interim I do not mind having the temerity to state that all cars without exception should be inspected periodically (whatever that may mean) for both emissions and general operating condition. It is depressing to hear critics say that inspection is worthless because "they just go through the motions," or "it is a political racket" — and other words to that effect. To which I respond that we ought to stop explaining why it works badly and try to make it work well.

Insurance — The more I reflect on the stringent regulations governing the licensing and insuring of young people, and the more I read the news of accidents and fatalities among the very young, the more I am thankful for tough motor vehicle bureaus, and for the careful surveillance by insurance companies of young drivers, r stly between 16 and 25.

But then I ponder the question of insurance laws that apply to 55-plus car owners, wherever laws exist at all. Insurance authorities say that rates generally do not rise with age; that they are a matter of company experience. Excellent. A fair and civilized way of handling it, says this driver.

Yet, I have an elderly friend who was licensed in his state in 1974, and the eye test he took at that time is apparently still good. He has had no hearing test either since '74. How does all this fit into the setting of insurance rates, one wonders.

On the other hand, I wonder if it is not precisely because seniors do worry about their frailties that they take good care of themselves and feel themselves in few ways inferior to younger, less experienced drivers — and in any event at least as insurable. At

present, there seems to be no reason why senior drivers cannot continue to be eligible for rates competitive with those for other age groups (they do after all have fewer fatal accidents than the younger set). The "let well enough alone" attitude appears to prevail among insurance companies, *at present.*

Ars Longa, Vita Brevis — What bothers this senior almost as much as the question of eligibility for auto insurance is the question of getting his hands on the right policy. I have a pamphlet about "shopping for insurance." Get quotations, it says; rates vary considerably. Read the policy, it advises. And consider the various company services to policy holders, it asks us. Also, it adds, inquire as to how they go about handling their claims and collecting their premiums, and other underwriting practices. The advice is biblical: "Ask and it shall be given you; seek and ye shall find."

Therefore, I got out the rate quotation for my present policy and put it alongside the quotation sheet of a company recommended as specialists for senior drivers. I tried to compare, and could not. Finally, I called first one company, then the other, and got each one in turn to explain what was being offered and at what cost and how they differed from the other company. "In short," said I, in exasperation to the representative of one company, "it is often very difficult to compare the incomparable."

I must not complain. I recognize that all insurance works according to experience in the market, and that in that market companies range from good-better-best to bad-worse-worst, and that there is often as much of the hard work of the artist as well as of the actuary in the creation of the policy. However, though art may be long, life is short. I have, therefore, concluded that the only way to avoid making an occupation of "getting the mostest for the leastest" in an insurance portfolio is to do just one thing: after buying a powerful lamp, go out like Diogenes and look for an honest person to be your broker and thus have done with it once and for all. The alternative may be an early demise from frustration.

Drinking and Driving

And what shall we say about America's great highway killer? Senior citizens have presumably reached the age of discretion, but as with a lot of the rest of us, they like their cocktails, especially their luncheon cocktails. A not uncommon sight in certain warm watering places of this land is the two-martini lunch in a scarlet jacket and lemon colored pants followed by the cautious crawl homeward to sleep it off. I have heard but cannot verify that it is not easy to gather good statistics. Apparently, when asked about drinking and driving, many seniors become shy and evasive. I for my part will say only that the two-martini lunch is a venerable institution not to be lightly tossed aside. Seniors will have none of such arbitrary treatment. As far as I am concerned, let them go to it so long as they know the rules of the game they are playing and the inordinately high stakes it involves. Meanwhile, solid research is being conducted and pilot projects tried.

Conclusion

To sum up. My impression is that our senior drivers are a lot more competent as a group than they are often represented as being — yet not all of them as good as they should be, and as some think they are, in the various phases of the driving task. There is room for improvement in vehicles and in driving environment, and it must be made. Growing senior population bespeaks it. Indeed, some "Percolation for Senior Driving" has already begun. The capability is there.

And dangers, too, if the problems are not approached carefully. Luigi Barzini has told us that the one thing that sets America apart, the frightening thing about this "truly different country" is its impatience. One danger, therefore, lies in the search for the fast and absolute cure. A sad spectacle of our political and economic life is the assurance

with which we are offered quick permanent fixes for difficult problems. Sometimes it seems the bigger the problem, the surer the solution.

On the other extreme is the danger of delay. The voter can be made to feel somewhat like Archy the Cockroach (of *Archy & Mehitabel*, courtesy of Don Marquis), who once uttered probably the wisest lament ever heard with regard to large systems of polity: "I am ashamed to say that I know no more of what it is that has to be done than the wizards and experts who at present are not doing it." As I said earlier, we sometimes take too long, and "kick it around." Problems get solved or solve themselves after endless attention or the inattention of procrastination.

Happily this is not true of all aspects of American life. Otherwise, we would have been out of business long ago. It goes without saying that most of the day-to-day news is bad. Every hour of every day some Cassandra is prophesying doom: "We are going down the tube" with regard to... You fill in the blank. But media do not live by good news, and one is not a Pollyanna for saying that the work important to daily life does get done and most of it done quite well. Not overnight or after festering for a while but after careful scrutiny by interested people.

To me it is no small accomplishment that millions of us operate with skill and ease in the world's largest and most complex traffic system. In the middle of the last century Thomas De Quincey was astonished that the English mail coach could attain "a breakneck speed of 13 m.p.h." We now take four times that speed as routine.

What astonishes me is the efficiency of our drivers in the face of the glaring deficiencies of the physical environment in which they operate. Thus, scandalous maintenance (the crumbling West Side Highway in New York City or its equivalent in your own state); endless postponement of necessary new construction to relieve terrible jam-ups (pick your own). In short we can take comfort in a well-trained driving public in a system that for all its faults is well governed. What surprises me, then, is not that the system is so bad, but that it is as good as it is.

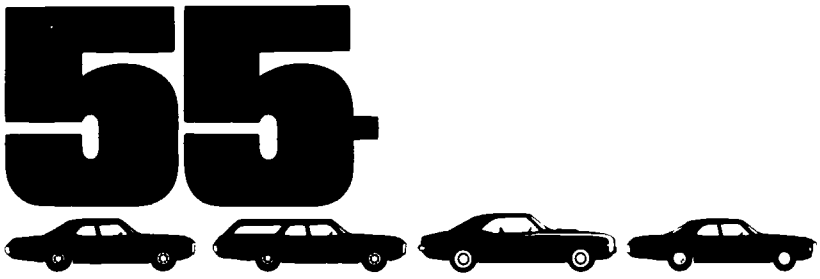
It did not happen overnight, and it did not creep up on us unaware. It was made to evolve. We want not just to keep it as it is — God forbid that — but to make it more efficient.

Our aim should be to do every positive thing we can to keep senior drivers behind the wheel and on the road, one way or another, as long as safely possible. And to take them off the road the moment that experience and mature judgment tell us they should henceforth be passengers.

We can be proud of our skilled professionals in and out of government: good administrators, thinkers who are also doers, capable research people, many working in relative obscurity, working patiently. They know that sooner or later we all have to learn about solving formidable problems: that impressions will impress only if they can be substantiated *and* if at the moment of recognition we have the will to address them.

Let these people now come together in consortium and work with a will to establish opening priorites for the dozens of practicable measures that have been brought forward on behalf of senior drivers. Some of the measures are, alas, as costly as pie in the sky; some have been sitting around for years waiting for action. But almost all are sensible measures to help seniors in the decades ahead remain qualified for the driving privilege as long as possible — and when the end of the line has been reached to disqualify them with all the grace we can summon.

In good conscience, we have no other choice.



The Older Driver and Highway Design

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SUMMARY

As the older driving population, similar to the overall population, increases, additional consideration in highway design is required to meet the needs of these drivers aged 55, 66, 75 or even older. First, information will be presented relative to the travel and accident experience of older drivers and their physical characteristics. An understanding of these characteristics is important to the design of highways. Then, suggestions will be provided to best accommodate older drivers in the design of highways and provision of traffic control devices. It will be shown that punitive restrictions on older drivers are of little value.

EFFORTS TO RESTRICT OLDER DRIVERS PRODUCE LITTLE BENEFIT

Travel Experience of Older Drivers

As people age, there is a sharp drop in the number of licensed drivers. For example, there are 2.5 million licensed drivers aged 35 and only 0.6 million drivers aged 75. Part of this decline is due to mortality and part to drivers giving up their licenses: while 95 percent of 35-year-old males are licensed drivers, only 69 percent retain their licenses at age 75. Among females there is an even greater reduction in licensed drivers — from 88 percent at age 35 to only 33 percent at age 75.

The average licensed driver reduces his or her driving considerably with age. The average 35-year-old male driver accumulates 17,000 miles each year; the 75-year-old male only 6,000 miles. Females reduce their driving from 7,000 miles to only 3,000 miles per year.

The combination of fewer licensed drivers and fewer miles driven each year results in a much smaller fraction of total mileage by older drivers. Thus, 35-year-old drivers account for 2.4 percent of all highway travel while 75-year-olds account for only 0.2 percent — one-twelfth as much!

Truck drivers, especially, reduce their driving as they get older, and 65-year-old truck drivers do only one-seventeenth as much driving as 35-year-old truck drivers. Comparing 65 and 35-year-old drivers in general, the ratio is only one-third. Such a result is not surprising, given the rigorous work of driving a truck for long distances in all types of traffic and weather conditions.

One other important change in travel habits of older drivers is their reluctance to drive at night. Male drivers, age 35, do 31 percent more driving at night on rural roads compared to the average driver; 75-year-old male drivers do only one-sixth as much night driving as the average driver. The daytime ratios are much closer: 1.15 and 0.64. Female drivers have night ratios of 1.02 and 0.37 for 35 and 75-year-old drivers respectively. Female day ratios are nearly identical for the two ages: 0.93 and 1.00 respectively. Table 1 shows these travel data for older drivers age 55, 65 and 75 and for a comparison group of younger drivers age 35.

Accidents and Older Drivers

It has been shown that while many older drivers, especially males, retain their driving licenses, they drive much less, particularly at night on rural roads. But what about accidents and accident rates?

One way of comparing accident information is based on a standard amount of travel — say 100 million vehicle-miles. On such a basis, male drivers age 35, while driving on rural roads, have only 140 reported accidents in the daytime for each 100 million vehicle miles of travel — an accident rate of 140. Male drivers age 75 have a rate of 500 — more than 3-1/2 times as great. Female drivers show similar increases with age and the night data also show substantial increases with age.

Another way of comparing accident data is on the basis of reported accidents per 100 drivers per year. On this basis, the differences are much less: 35-year-old male drivers in California had 5.9 reported accidents per 100 drivers per year. The comparable figure for 75-year-old male drivers was 4.8. For females, the figures were 3.8 and 3.3 respectively. The reduced driving of older drivers more than compensates for their higher mileage-based accident rates at least to age 75, and, for non-fatal accidents, to age 85. As a result, older drivers typically experience no increases in motor vehicle insurance premiums. As shown in Table 1, nationwide estimate of accidents per 100 drivers per year provides much larger numbers than the California data, probably because of differences in reporting levels and possible inclusion of unreported accidents. Nationally, too, differences among age groups are moderate.

One other comparison is instructive: older drivers reduce their speeds only slightly

Table 1
Travel and Accidents of Older Drivers

Travel	**Age:**	**35**	**55**	**65**	**75**	**85[1]**
No. of Licensed Drivers, Millions		25	19	12	06	02
Pct. Having Driving Licenses.	Male	95	94	86	69	40
	Female	88	70	61	33	10
Annual Miles Driven	Male, Thousands	17	14	9	6	4
	Female, Thousands	7	6	4	3	2
Pct. of Total Miles Driven	All Drivers	24	14	07	02	04
	Truck Drivers	34	15	02	NA.	NA.
Night Driving Ratio, Rural Roads.	Male	131	070	017	NA.	NA.
	Female	102	063	037	NA.	NA.
Accidents						
Daytime Accident Rate[2], Rural Roads.	Male	140	130	230	500[3]	800
	Female	195	210	300	700[3]	*1200*
Nighttime Accident Rate[2], Rural Roads.	Male	400	390	530	850[3]	1300
	Female	470	740	1050	2300[3]	*3500*
Accident Rate[2], Truck Drivers		122	140	196	NA.	NA.
Accidents per 100 Drivers per Year, in California	Male	59	47	40	48	6
	Female	38	26	25	33	4
Accidents per 100 Drivers per Year, Nationwide		20	11	13	14	16
Fatal Accidents per 100,000 Drivers per Year—Nationwide		38	21	24	41	60
Speed						
Mean Speed, Rural Roads	Day	528	523	510	NA.	NA.
	Night	509	503	498	NA.	NA.
Alcohol						
Percent of Drivers with Blood Alcohol Levels >—All Fatal Accidents		33	20	17	7[3]	NA.
—Weekend, Night Fatal Accidents		78	66	67	40[3]	NA.

1 Drivers age 65 and older
2 Accident rates are no. of accidents per 100 million veh mi of travel
3 Extrapolated

Sources: Personal Transportation Survey, U.S. D.O.T., Federal Highway Administration, 1977 Accidents on Main Rural Highways, David Solomon, Federal Highway Administration, 1964, reprinted 1974 Senior Driver Facts, California Department of Motor Vehicles, 1982 The Effect of Truck Size and Weight Accidents and Traffic Operations, Vol. 3, Federal Highway Administration 1981 Accident Facts, National Safety Council, 1982 Alcohol in Fatal Accidents, National Estimates, Ezio Cerrelli, National Highway Traffic Safety Administration 1983

(about 3 miles per hour both day and night) when drivers 65 years of age and older are compared with 35-year-old drivers. These speed and other accident comparisons are shown in Table 1.

Alcohol and Older Drivers

It has been suggested that older drivers are more likely to consume excessive amounts of alcohol and therefore particular attention should be given to this group. In fact, as shown in Table 1, only 17 percent of 65-year-old drivers involved in fatal accidents have blood alcohol levels of 0.10 or greater (legally "intoxicated" in nearly all

states) compared to 33 percent of 35-year-old drivers.

Physical Characteristics of Older Drivers

In a classic paper prepared in 1960, B.W. Marsh[1] demonstrated clearly that older drivers, on average, experience dimunition of their abilities to judge distance, and react to simple and complex tasks. They are more likely to have impaired vision and hearing. Their field of vision is less and their sensitivity to glare is much greater than that of younger drivers. Some of these comparisons are summarized in Table 2.

Accommodating Older Drivers in the Design of Highways

Considering the foregoing information, it is clear that older drivers are less able to cope with our nation's highway systems. Compared to younger drivers, they have substantially higher mileage-based accident rates. Their decreased reaction time, vision and hearing, distance-judging ability and glare resistance, may be among the factors contributing to these substantially higher accident rates. Fortunately, older drivers, particularly males, reduce their driving, generally and especially, during the critical night hours. On rural roads, they only reduce average driving speeds only a few miles per hour, and this, too, is fortuitous because excessively slow driving is as hazardous as excessively fast driving.

What is being done to accommodate these older drivers in the design and operation of highways? What further measures need to be instituted?

The Interstate System

For the past 50 years, the key principle employed in the design of highways has been that roadside, geometric and surface configuration should fit the capabilities and limitations of drivers and their vehicles. Thus, the nation's principal highway system, the 43,000 mile National System of Interstate and Defense Highways has *full control of access, i.e.*, roadside business driveways cannot enter the Interstate System directly, there are no cross roads at-grade, and thus no stop-and-go signals. A wide median or a median barrier separates the two directions of traffic. Interchanges are carefully planned with long speed-change lanes. These types of highways minimize or eliminate the need for drivers to perceive and react quickly to vehicles entering at slow speeds or at right angles. They simplify and reduce the magnitude of choices drivers need to make. With large, carefully designed guide signs, they greatly reduce ambiguity and increase time available to the driver for decisions. At night, the wide medians greatly reduce glare.

The geometric design of the Interstate System is also superior, with relatively flat curves and easy grades to minimize speed differences and to increase sight distance. Wide shoulders facilitate emergency stops and critical maneuvers. Pavement cross-section, aggregates and surface mix design are carefully controlled to facilitate water drainage and provide the good wet pavement frictional properties required for the high operating speeds prevailing on the Interstate System.

As a result of these and other improvements in the details of highway design, including guardrail and impact attenuators, Interstate Highways have, by far, the safest record of any of the nation's highway systems. They typically have mileage-based fatality and accident rates only one-third to one-half as great as those of conventional highways carrying similar traffic.

Older drivers who, on average, experience decreases in physical capabilities obtain special benefits from the Interstate System because it is possible to safely drive a vehicle on this system with less than optimum physical abilities.

[1]Aging and Driving by Burton W. Marsh, Proceedings, ITE, 1960.

Other Highway Systems

In a nutshell, the Interstate System has been so successful in terms of safety and traffic operations because it facilitates the free flow of traffic: no stops, no sudden decelerations to avoid entering vehicles, no swerving to avoid head-on traffic in one's lane, etc. Other types of highways have been less successful. The worst example is the four, six or eight lane highway without control of access.

Typically, a new arterial highway is built on new right-of-way but without control of access, *i.e.*, abutting property owners are given the right to enter the new arterial highway directly from their property. Initially, the highway operates well. Speeds are moderately high, few property owners sell, lease or use their property for commercial purposes. As the years pass, traffic volumes increase, a few roadside businesses are established which attract further traffic. Increasing conflicts at the intersections result in the installation of stop-and-go signals. There is more traffic, more roadside business, more conflict, and the accident rate also increases — sometimes to 5 or 10 times the former level!

In today's social and political climate, it is often difficult to build new freeways on new rights-of-way; and so older two-lane highways are often widened to four, six or eight lanes but without full control of access and with many signalized intersections at-grade. Such highways will also experience the hazardous scenario previously noted. These types of uncontrolled access highways are especially difficult for older drivers.

Is there any solution to this dilemma? Possibly. The first step is to better inform the public and political leaders of the hazards of highways that do not have full control of access. Second, those who oppose new freeways with their built-in safety features should be labeled for what they often are: selfish individuals with axes to grind. Third, in planning new highways, the safety benefits of the freeway alternative needs to be given much greater emphasis.

While much can be done to improve existing highways without full control of access, the results will not produce the safe operating conditions of freeways/Interstate highways. The Federal Highway Administration has several publications that are being used by many of the State Highway Departments to upgrade these older highways. The results, of course, benefit all drivers and are especially valuable to older drivers.

Table 2.

Selected Physical Characteristics of Older Drivers

Age:	35	55	65	75
Distance Judgement Score	112	106	95	NA
Simple Reaction Time—Seconds	045	048	051	NA
Complex Reaction Time—Seconds. Male	056	067	077	0.82
Female	067	075	082	087
Visually Impaired—no. per 1000 people	12	25	50	110
Hearing Impaired—no per 1000 people	25	57	90	180
Field of Vision Score	386	376	370	NA
Glare Resistance Score	17	10	6	NA

1/Age 72
2/Interpolated.
Source Aging and Driving by Burton W Marsh, Proceedings. ITE. 1960

The Average Driver and the nth Percentile

Highways should not be designed to accommodate the average driver or the average vehicle. Rather, they should be designed to accommodate a high percentage such as the 95th, 99th or even 99.99th percentile (the nth percentile) of all drivers or all vehicles. Where this principle is ignored, an accident is often the result. For example, 99 percent of all drivers may be able to negotiate a specific sharp curve in wet weather when the coefficient of friction is only 0.3. But the remaining 1 percent may slip, skid, radically reduce speed, etc., and perhaps 1 in 100 of these may be involved in an accident as often as twice a month. Experience has shown that "slippery when wet" signs do not work; the solution is to provide an enduring skid resistant pavement surface to accommodate not 99 percent but 99.99 percent of all drivers and thereby reduce wet weather accidents at this curve to perhaps one every two or three years. The solution may require a special oper graded porous friction course *but* the results — a coefficient of friction of perhaps 0.5 and many fewer wet weather accidents — will be well worth it.

Another typical situation for which the nth percentile needs to be higher is in the placement of guide signs and route markers. At a typical city street intersection, a single route marker (U.S. numbered or State) with arrow will accommodate 94 percent of all drivers without error, *i.e*, 94 percent of the drivers will take the correct turn. But six percent of the drivers will miss the turn. Addition of a second route marker in advance of the turn will reduce the error rate to about 1 percent.

Clearly, the percentile to be used depends on the critical nature of the situation: when a high-speed accident may result, 99.99 percent or an even higher percentile of all drivers need to be accommodated; when only a loss of time or convenience may result, 99 percent may be adequate.

How do older drivers fit into this situation? These drivers are more likely to be included in the upper percentiles; and the result, as shown earlier, is higher mileage-based accident rates, particularly for those over age 65. Thus, to accommodate older drivers, more attention needs to be given to the use of higher percentiles for critical highway conditions.

An example of the prevalence of older drivers in the higher percentiles is provided by an AAA report on night vision[2] Fewer than 6 percent of all men drivers had night vision scores of 30 or above (relatively poor). More than 22 percent of those age 55 and over had scores of 30 or above. Put another way, men age 55 and over accounted for only 10 percent of all the drivers but more than 40 percent of night-vision scores of 30 or above. Interpreting the above data, a lighted highway sign designed to accommodate 94 percent of men drivers in terms of night vision will accommodate only 78 percent of those age 55 and over. If the 98th percentile is employed, (a night-vision score of about 120), it will accommodate 90 percent of the older group.

Other Considerations

As has been shown, high quality highways will accommodate nearly all drivers including older ones. In some instances, however, additional measures are needed. In or near retirement communities, for example, it may be desirable, among other steps, to increase the size of street signs; widen parking spaces slightly and take extra care that pavements have good frictional properties when wet.

Where there are large numbers of elderly pedestrians, a considerable number of additional measures are needed to accommodate them. The AAA, Federal Highway Administration and others provide pedestrian-related publications which may be of assistance.

[2]Age and the Ability to See at Night, T.F. McGough, AAA, Res. Report No 43, 1953.

Table 3

Reported Accidents by Groups of Drivers in Two Successive Time Periods

California Data, one-year time periods: 1962, 1963

Number of Accidents This Year	Percent of Drivers	Percent of Accidents This Year	Percent of Accidents Next Year	Zero Accidents Next Year Percent
0 or more	100.0	100.0	100.0	94
1 or more	6.7	100.0	11.5	90
2 or more	0.5	13.9	1.1	87
3 or more	04	2.0	.1	85

Punitive Restrictions on Older Drivers

A common but erroneous belief is the idea that safety will be enhanced by restricting older drivers who are "repeat" offenders in terms of accidents or violations. Such a notion is false, as shown by an analysis done by the Federal Highway Administration some years ago.[3] The analysis revealed that fully 87 percent of drivers who had two or more reported accidents "this" year, will have zero accidents "next" year if no action at all is taken against those drivers! For 3 or more accidents, the comparable figure is 85 percent as shown in Table 3.

Use of restrictive techniques is tempting to those responsible for legislative or administrative actions concerning older drivers, because only a small portion of all drivers are involved. As Table 3 shows, while only 0.5 percent of all drivers and probably a similar proportion of older drivers have 2 or more accidents "this" year, this small group accounts for fully 13.9 percent of all accidents "this year". Because nearly all of these accidents occur by chance, however, "next" year, this group of drivers will have only 1.1 percent of the accidents.

Thus, some misguided individuals may falsely believe that sending these few "repeat" drivers to school or for reexamination or subjecting them to admonishing letters will have a substantial safety benefit. It is true that when viewed *as a group*, a benefit may seem to result because of the statistical phenomenon known as regression to the mean which is amply demonstrated in Table 3.

In fact, however, there is no real benefit, only harrassment of the 85 or 87 percent of the group who would have had no accidents next year anyway, even if nothing had been done to these drivers. Most of the remaining persons in the group would have had only 1 accident next year, and this, too, is probably a chance occurrence. The types of random, punitive, group procedures recommended for older drivers at this very conference are unworthy of a free society. They should be rejected out-of-hand.

Let us return now to the illustration shown at the beginning of this paper In a state with 5 million drivers, about 10 percent or 500,000 drivers will be over age 65 and, as

[3]Reported by the writer in "Highway Safety Myths," North Carolina Symposium on Highway Safety, page 39, Spring, 1970.

Table 3 shows, about 0.04 percent or 200 drivers will have 3 or more accidents this year for a total of approximately 700 accidents. Next year they will only have one-twentieth as many or 35 accidents.

Conclusion

Older drivers drastically reduce their travel, especially at night. Therefore, although their physical faculties are diminished and they experience higher mileage-based accident rates, the annual number of accidents they accumulate is no greater than that experienced by younger drivers.

The best way to accommodate older drivers is to provide highways that are easy to drive on, *i.e.* Interstate Highways or Freeways. These provide safety and free flow of traffic for all drivers, including older ones. The details of highway design should accommodate a high percentile of all drivers, the 99th or even 99.99th percentile and not the average driver. Efforts to restrict older drivers produce little benefit.

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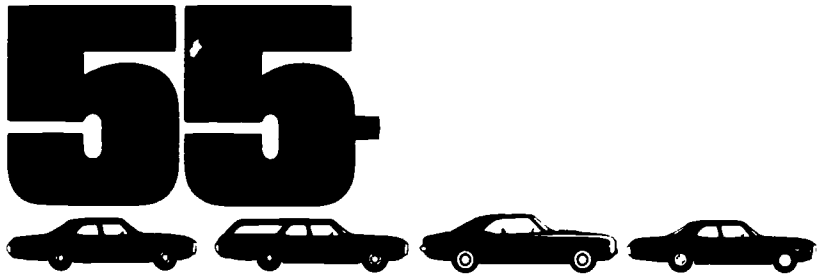

Musculo-Skeletal System Impairment Related to Safety and Comfort of Drivers 55+

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Accident rates and accident injury severity increase dramatically for motorists over the age of 55. The author, an orthopedic surgeon and motor vehicle accident investigator, examines this statement with respect to causation, treatment and prevention, reflecting his own experience and knowledge of current medical, safety and automotive engineering literature.

The much increased risk of accident and accidental injury of the elderly motorist has been masked by a lack of exposure data. The age group 16-25 is grossly overrepresented in accident and accident-injury data because their numbers exceed those of the 55+ group; and until recently, exposure on the highway has not been considered. Studies by Preston [1] and Planek [2] have revealed that the younger age group spends many more hours behind the wheel than drivers 55 and over. The latter typically decrease their driving exposure after retirement. If accident rate and injury-severity data are normalized for exposure, the rates of the driver 55+ approximate those of the younger age group.

Physiological and Pathological Basis for Increased Accident and Injury Rates of Drivers 55+

Physiologic changes occur in the musculo-skeletal system and in part account for the increase in accident and injury-severity rates for drivers 55+.[3] Reaction time is necessarily increased by athritic joints and tight musculature. Joint flexibility is a related factor caused by those changes in the joints that are precursors of arthritis but not identified by the clinician as pathological. Aging brings about changes in the components and structure of the articular cartilage, underlying bone, ligaments and musculature which impair the capability of the musculo-skeletal system to perform the driving act.

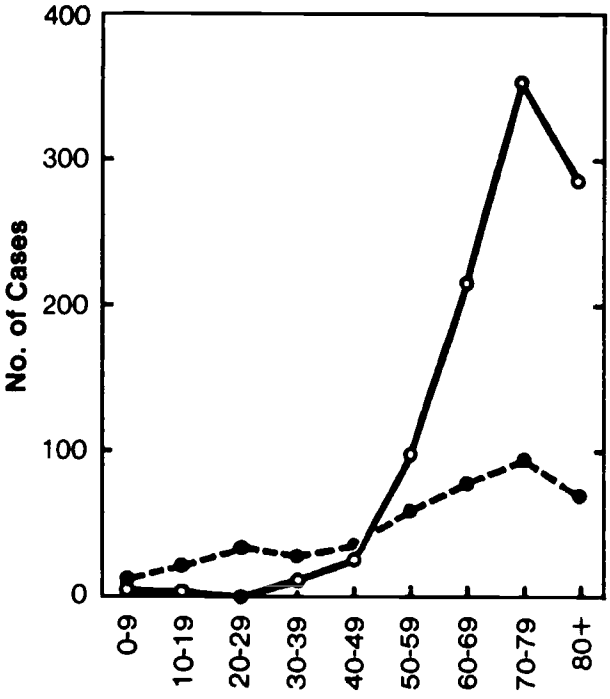


Figure 1

The frequency of fractures increases rapidly after age 50 Solid-line. females. Dash-line: males. Source (6)

In addition to the joint flexibility, muscle strength diminishes with age. Although automobile power steering, power brakes and power seats compensate for these losses, there is nevertheless a degradation of performance. Lastly, discomfort and pain while one is passively seated or active in vehicle-control motions further impair the driving act. Passive discomfort leads to early and excessive fatigue and distraction. Discomfort during motions of joints necessary for vehicle control slows such responses and at times may even prevent appropriate responses, particularly in emergency situations.

Injury severity is more closely related to age than any other factor in motor vehicle accident investigation. Impact studies of cadaver chests by Schmidt reveal that rib fractures were more closely related to the age of the specimen than to the speed of the impact.[4] Aging had decreased the ability of bone to withstand impact injury. Fractures are much more common in drivers 55+.[5, 6] Hospital admissions, emergency room visits and mortality rates from accident injury are much higher for this age group.[7, 8]

A variety of known aging-changes are reported in the literature. The mineral content, particularly calcium, of bone diminishes with age.[9, 10] Females are particularly at risk because of the pathological phenomenon of osteoporosis which occurs in 20% of women over age 55. Less well understood changes occur in the strength and resilience of the collagen fibers which make up the matrix of bone and are the principal constituents of muscle, ligament and articular cartilage.[11] Collagen loses its elasticity and ultimate strength with age.

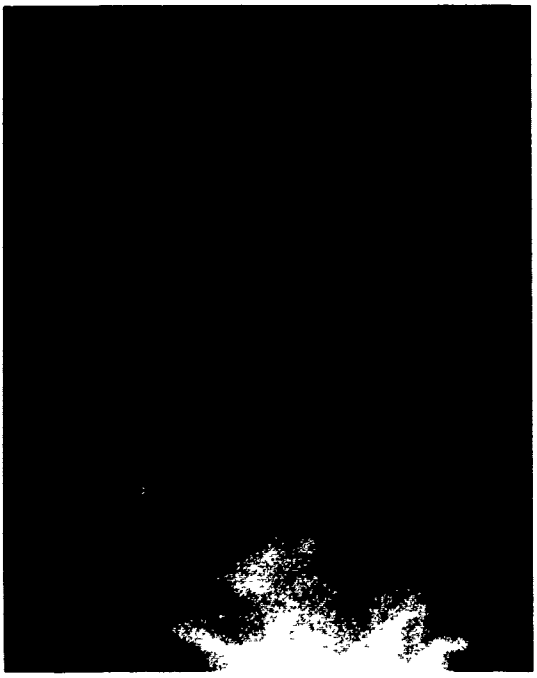


Figure 2

Bones become more fragile with increasing age in both sexes. Abnormal calcium loss (osteoporosis) as illustrated by this x-ray occurs in 20% of all postmenopausal women and less frequently in men. Such patients have a much increased risk of fractures.

From a gross anatomical viewpoint, the musculature of the driver 55+ is tighter because of less active stretching from heavy manual labor, sports and/or stretching exercises. Muscle strength and mass diminishes with age. The active musculature is the most effective energy absorber in the human body, but this function is dependent largely on muscle strength. Aging diminishes the capability of the human body to absorb because of increased bone mineralization, decreased collagen strength and resiliency, and decreased energy-absorbing capability of the musculature, bone and articular cartilage of joints.

Degenerative arthritis is the most common pathological condition that occurs because of changes in the energy-absorbing capability of the musculo-skeletal system. The articular cartilage of a joint thins and ultimately is destroyed in degenerative arthritis. The underlying bone is exposed, allowing bone-to-bone contact and causing pain. Pain results from exposure of nerve endings in bone directly under articular cartilage. There are no nerve endings in articular cartilage. Bony spurs appear along the margins of joint affected by degenerative arthritis. These spurs represent calcification and bone formation in the ligaments of a joint. Range of motion decreases because of mechanical interference of the spurs, and ligamentous and muscle tightness and pain. Degenerative arthritis is caused by aging, by fractures which extend into the joint or by injury which crushes the articular cartilage. Alcoholism, prolonged steroid use, congenital or childhood abnormalities, and loss of circulation may also cause degenerative arthritis.

Medical and Surgical Treatment for Musculo-Skeletal System Impairment

Total joints which have been commonly available for more than a decade, can significantly reduce the morbidity of arthritic joints. Total joints can be obtained for

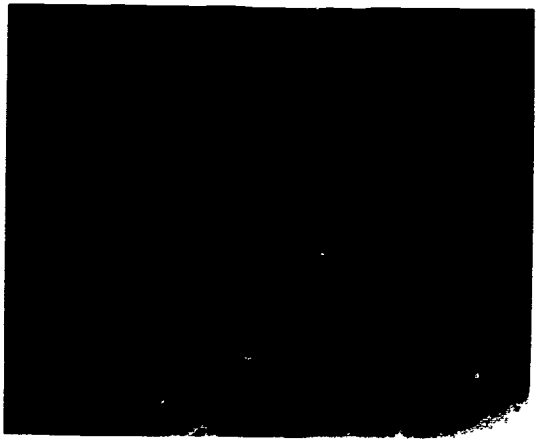


Figure 3

Degenerative arthritis can occur in any movable joint. It is characterized by progressive loss of articular cartilage and the growth of bony spurs around the periphery of a joint. The illustration is an x-ray of the cervical spine of a 76-year-old man with severe degenerative arthritis. He had virtually no neck motion.

the shoulder, elbow, wrist, finger, hip, knee, ankle and toes. They are commonly used in fingers, hips and knees and are highly successful in reducing pain and, to a lesser degree, in increasing flexibility and strength.

Degenerative arthritis of the spine is a common cause of driving impairment. Surgical treatment is necessary for more severe spine impairment. Disc excision, nerve root dissection with spur excision and spine fusion are commonly employed to reduce spine impairment. Such procedures relieve pain but frequently decrease range of motion, causing residual impairment. Lesser degrees of degenerative arthritis of the peripheral joints and spine are treated with anti-inflammatory drugs, particularly the non-steroidal variety. The most often used anti-inflammatory is aspirin. Others commonly used are ibuprofen, indomethacin, and a half dozen similar drugs.

In the past, before the availability of total joints, fusions of the hip, knee and shoulder were performed. These procedures eliminated motion in the operated joint. Some compensation was possible through increased motion in adjacent joints. Prolonged use of such compensatory mechanisms led to degeneration of the adjacent compensating joints and was self-defeating over a patient's lifetime. Ankle fusions continue to be performed because a satisfactory ankle joint replacement has not been developed, although total ankle joints are used in younger patients. Ankle fusion is less disabling because compensation in the midtarsal and tarsal joints of the foot and knee joint can accommodate most impairments.

Ligamentous and other soft-tissue and joint-surface injuries of the knee are a source of driving impairment and, in drivers 55+, of degenerative arthritis. Such injuries commonly occur in contact sports and skiing. Modern surgical treatment permits repair of collateral ligaments but not the centrally located, more complex cruciate ligaments. Meniscii are the gristle-like structures between the femur and tibia which improve load distribution on the articular cartilage and joint surface nutrition. Meniscii may now be resutured, repaired or partially excised, rather than completely removed, as was common practice until a decade ago.

The shoulder is a common site of ligamentous injury. Surgical repair of the rotator cuff and of the capsular structures torn in dislocations can restore the shoulder to nearly normal function and is now commonly done. A variety of hand-surgery procedures are now available to restore function after ligamentous, muscular or bony injuries, or because of degenerative arthritis and other degenerative disease of the hand. The elbow is less amenable to surgical therapy. Total joints are available but are not widely used because of problems with loosening, implant breakage and instability.

Figure 4

Simple adaptive devices are available which permit total control of a car using the upper extremities only The thumb lever controls the accelerator and the entire bar controls the brake pedal.

What Parts of the Musculo-Skeletal System Impair Driving?

In view of the residual impairment of the musculo-skeletal system, it is necessary to examine the role of that system in the many activities necessary for driving. The spine plays a central role because it is the principal supporting element of the human body. The ability of a driver to remain upright and move is largely dependent on the spine. Limitation of motion in the cervical spine limits head rotation and vision to the side. Degenerative changes in the cervical spine are the most common cause of limited rotation. This limitation may lead to increased frequency of side-impact accidents. No satisfactory medical therapy is available for restoring head and neck motion. Degenerative changes in the dorsal (chest) and lumbar spine may lead to chronic pain, increased fatigue and increased muscle spasm. Such impairment may not be recognized by a driver or may occur in situations where the driver cannot give up driving.

The upper extremities play a vital role in the driving act. Their function is essential for steering, shifting gears and such simple acts as closing doors and turning on lights and the ignition. Power steering has reduced strength requirements, but mobility and coordination remain essential. Loss of these elements can be compensated to some extent through behavioral changes and positioning. For severe losses, special adaptive devices include no-load power steering and a variety of special switches requiring a minimum of muscular effort and coordination. A quadriplegic with severely limited hand motion and strength is now able to enter, operate and leave a specially equipped motor vehicle. Upper extremity amputees may continue to use automotive controls through special interlocks for prostheses and the steering wheel, shift lever, ignition, light switches and other controls.

The lower extremities require more strength and stability but less coordination for satisfactory performance of the driving act. Painful and/or stiff hip, knee or ankle joints

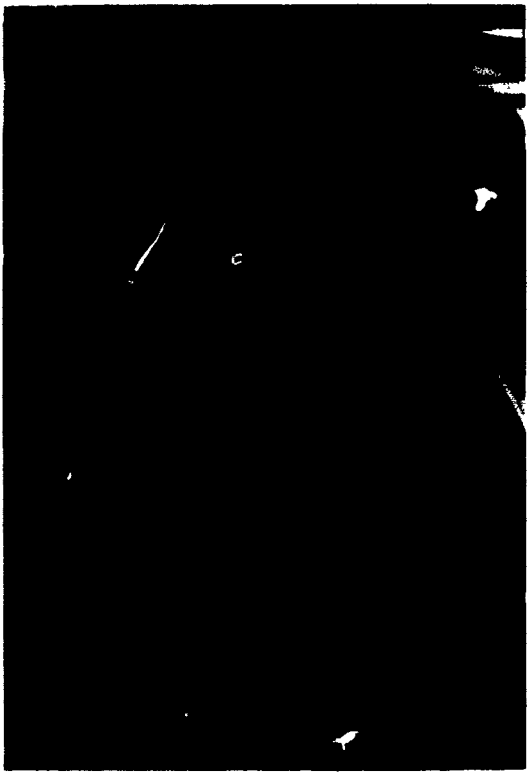


Figure 5

Safety belts are the single most effective safety device for motorists of all ages except infants. Infants should be restrained by special infant restraint systems.

are significant driving impairments. Behavioral compensation is possible by use of the other leg in cars equipped with automatic transmissions. Some training is necessary, but properly motivated drivers can continue to drive by using the left rather than the right lower extremity for the brake and accelerator. Patients with bilateral amputations, or with severe bilateral impairment because of arthritis, paralysis or medical problems, should use special adaptive controls. These are relatively simple devices which permit brake and accelerator control with the upper extremities. For the patient with bilateral, upper-extremity total impairments special adaptive controls permit entire vehicle control with the lower extremities.

Occupant Protection Through Vehicle Design for Drivers 55+

Since World War II major advances have been made in motor vehicle design for occupant protection. Safety belts, air bags, padded occupant interiors and other occupant-packaging safety designs are now commonplace. However, little attention has been directed toward the special needs of the drivers 55-and-over.

Severe chest injury can result from shoulder harnesses. Fractures of the clavicle, ribs and spine may occur because of belt restraint systems. More severe injuries of the lungs, heart, major vessels and abdominal organs may also be caused by the restraint system. The only available safety belt system is the diagonal shoulder belt combined with a lap belt. This has evolved because of its convenience, low cost and public acceptance since the early 1960's. Double, over the shoulder, inverted Y-harnesses were available in a high-performance speciality car in the late 60's (Shelby-American

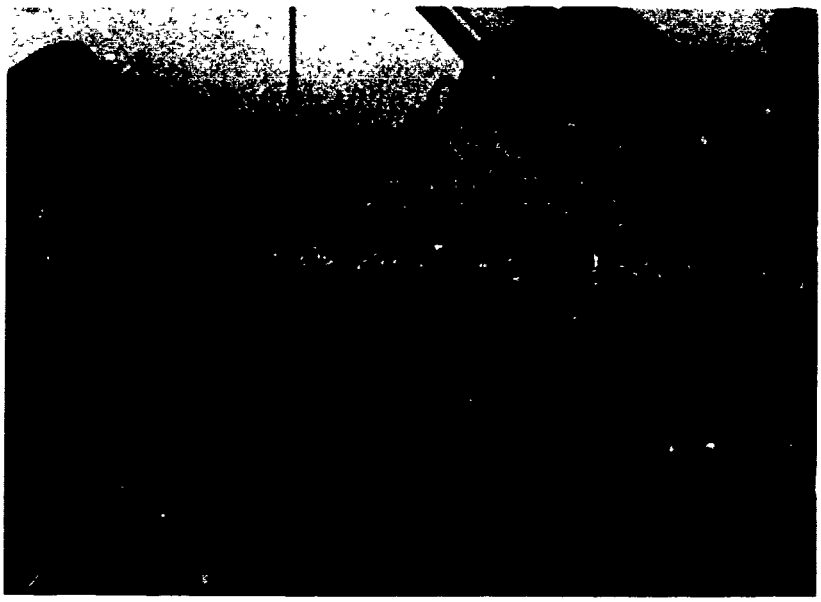


Figure 6

Air bags are located on the steering wheel and the center and right dashboards. Sodium azide, a low grade explosive, inflates within 30 milliseconds. Holes in the bags permit deflation in 300 milliseconds to prevent rebound.

Mustang — 1967 & 68). This system was rejected by the federal government because it was not easy enough to use to be considered automatic. Six-point harness systems are universal in automobile racing but are too difficult to use for passenger car application. The United States Federal Motor Vehicle Safety Standards require the diagonal shoulder and lap belt (3-point system). (12)

An alternative to safety belts is a system of passive restraints. The need for them remains paramount in the United States because safety-belt usage rates are less than 20% nationwide. Although virtually all other developed nations of the world have safety-belt usage laws, at this writing, only New York State has enacted a safety belt use law. It became effective January 1, 1985. Air bags, the best known of the passive restraints, have had limited experimental and productive application. Approximately 3,000 air-bag-equipped cars have been experimentally produced since 1972. An additional 10,000 were produced and sold to the public by General Motors between 1973 and 1976. Experimental and field accident-research has demonstrated the effectiveness of air bags for injury control.

Cost and technical difficulties of installing air bags in small cars have prevented a government mandate for their installation at this writing. The U.S. Department of Transportation has not issued a final ruling concerning their installation and further development. Cost appears to be a major impediment. Although the government has estimated cost as low as $200 per car, the industry now estimates the cost of a system for both front seats to be $600 to $1,000. The cost may be 10% of the total cost of the car, a figure which is excessive for most car owners, considering the fact that they may never utilize the safety device.

Installation of air bags in subcompact cars continues to present technically serious and possibly insurmountable problems. Children standing in front of the dashboard

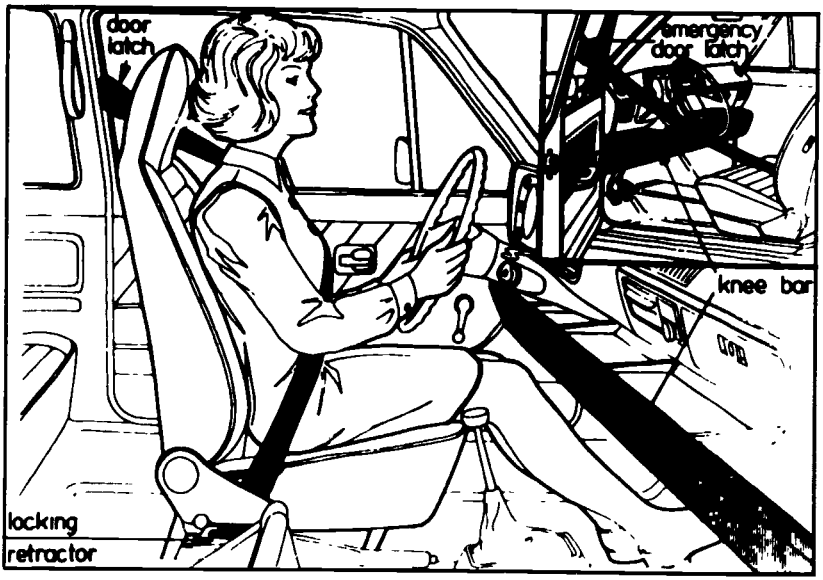


Figure 7

The Volkswagen Rabbit automatic (VW RA) belt system utilizes a shoulder belt, a knee bar and a special seat design to reduce forward motion of the buttocks. The upper shoulder-harness anchor is on the door, automatically lifting the belt off the occupant when the door is opened.

and drivers 55-and-over may sustain serious or fatal injury from the air bag, creating an untenable product-liability risk for the manufacturer. Serviceability is a question little examined. Air bags may be inadvertently deployed by short circuiting the sensors or other wiring beneath the dashboard or hood. Replacement costs will far exceed the initial installation cost and would be covered by insurance only in crash situations and not in inadvertent deployments.

Simpler, less complex and less costly passive systems are becoming available. Pioneered in 1975, Volkswagen's VW RA Rabbit system consists of a single diagonal shoulder belt, a knee bar and a special seat design to restrain the proximal thighs and buttocks. Over 500,000 cars so equipped have been sold in the United States. The death rate as revealed by the Fatal Accident Reporting System of the U.S. DOT is less than half that of other 2000-lb cars. (13)

General Motors has in production two cars (Buick Skylark & Pontiac Fiero) which provided sufficient protection for the unrestrained occupant in a 90-barrier impact. They used an improved test-dummy (Hybrid III) to meet the federal injury criteria without restraint systems. Improved front-end crushability, dashboard design, windshield configuration, steering wheel and seat design — all contributed to this improved safety performance.

The passive restraint effort of the federal government is directed at the total driving population. It is of greater importance to drivers 55+ because of the increased risk and severity of impact injury for this age group.

Seat Design for Safety and Comfort

Low back pain is a common complaint of older drivers. Young motorists appear to be able to sit in almost any seat with reasonable comfort and lack of fatigue. In contrast,

Figure 8

The VW RA seat used in VW Rabbits manufactured in Europe. Note the upward sloping pan, which is a seat cushion support, and which prevents excess forward and downward motion of the buttocks.

drivers 55+, because of less flexibility in their spine, decreased muscle strength, and increased muscle tightness become uncomfortable sitting in most automobile seats. The only consistent seat design goal of the automotive industry has been consumer acceptance. This acceptance has been based on the superficial examination of seats in the showroom followed by short road-tests.

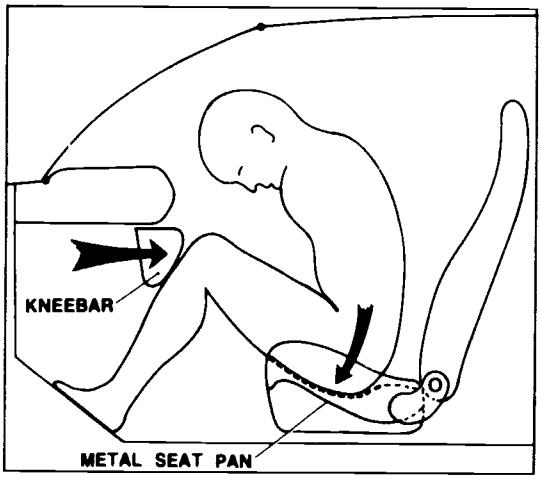
There are three schools of automotive design. The Teutonic school is exemplified by Mercedes, Volkswagen, Volvo, BMW and Saab who produce seats with stiffer padding (particularly for the low back), infinitely adjustable seat back angles, and lateral support for the torso. Volvo and Volkswagen have introduced a hopup in the seat cushion to prevent forward displacement of the buttocks and proximal thighs in head-on impact situations.

The second school of seat design is that of the American, Japanese and French industries. With few exceptions the lower seat cushions are very soft. The buttocks of belted occupants can bottom out on the floor in head-on impact accidents. Seat backs are similarly soft, usually lacking extra support for the lumbar spine. The back angle is adjustable in luxury cars but typically by rachet rather than infinitely variable adjustment. Side support is minimal or non-existent.

The third school is that of competition-car builders. Automobile-competition cars have seats with little or no padding, excellent lateral support for the pelvis and chest, and most have seat cushion hopups to prevent forward displacement of the buttocks and proximal thighs. The advantages of these seats are reduction in fatigue of the low back musculature because of the minimal padding and lateral chest support, better feedback from the vehicle itself with relation to tire adhesion, braking, acceleration and steering, and improved impact protection because the seat complements the function of safety belts.

Figure 9

Knee bars are used in all passive restraint systems. The knees and the buttocks are the principal energy input targets. Anatomically, they are more capable of transmitting force without injury than any other structures of the human body.



Comfort for Drivers 55+

Little research has been carried on to determine what makes a seat comfortable. General Motors conducted a popularity contest. Fifty people were asked to sit in seats from twenty different manufacturers and to grade the seats on a variety of characteristics.[14]

More significant research has been done by Anderson and Ortengen with funding from Volvo.[15] They determined that lumbar spine support was vital for fatigue control and comfort. Seats with excessive softness in the lower part of the seat back allowed the lumbar spine to flex, placing excess demand on the extensor musculature of the spine. Sufficient stiffness in the lower seat-back to induce mild lordosis or extension relieves the extensor musculatures. The same investigators also determined that the optimal back angle is 120 degrees from the horizontal. Subsequent research, however, has revealed that the ability to change back angle is essential for comfort and

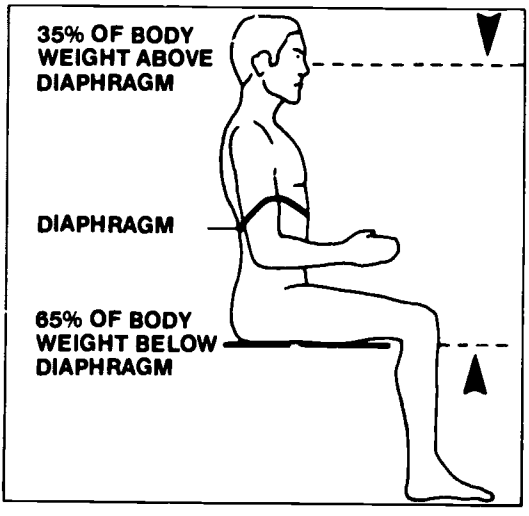


Figure 10

Approximately two-thirds of the body weight is below the diaphragm. This fraction of the human body can be restrained by the knees and the buttocks in head-on accidents.

Figure 11

Vehicle pitch can be controlled to permit optimal functioning of the knee bar-seat cushion restraint systems. This is accomplished in the VW Rabbit by corrugating the front frame members, decreasing their longitudinal stiffness, reducing front-end pitch.

fatigue control. That back angles up to 140 degrees are comfortable has been demonstrated in competition car construction.(16) Drivers with tight ham strings and back extensors may be more comfortable in seats with increased back angles.

Lateral support of the chest provided by deep bucket seats is helpful in controlling fatigue and providing comfort. Lateral support reduces or eliminates the demand upon the musculature in the flanks which controls pelvic tilt. This musculature actively functions to keep the driver upright in conventional seats without lateral support. Tilt of the pelvis induced by road irregularities and cornering forces the flank musculature to transmit loads from the pelvis to the lower rib cage to maintain the upright position. A bucket seat with chest support will transmit load to the chest, relieving the flank musculature and reducing fatigue.

Other Occupant Protection Design Considerations for Driver 55+

Kneebars, a vital part of all passive restraint systems are designed to be impacted by the knees in head-on impact accidents. Optimally, the occupant jack-knifes, forcing his buttocks into the seat cushion and his knees forward into the lower dashboard. Suitably designed kneebars can absorb high accelerations and loads, and can distribute load to the distal femur, patella and proximal tibia without producing injury. The typical design, as exemplified by the VW RA System, has a sheet-metal core approximately 6 cm in diameter covered with dense, close-cell plastic foam. The plastic foam distributes the load and absorbs energy. The sheet-metal core collapses, providing further energy absorption and load distribution. Control of the lower extremities through energy input targets on the knees and the buttocks can manage two-thirds of the body weight, essentially that weight below the diaphragm.

Vehicle pitch control is essential to prevent ejection of the driver through the windshield. This can be accomplished through front-end design. The frame members are made more deformable through corrugation or other design changes. The upper fenders and hood are stiffened so that a vehicle remains horizontal in a head-on impact rather than pitching: *i.e.*, rear end coming up. Prevention of pitch allows the occupant to sink into the seat, and to jack-knife into the kneebar.

Safety Belt Injuries

Lap belts have produced fatal abdominal and chest injuries. Canadian studies reveal that lap belts are unavoidably placed over the soft part of the abdomen because of obesity, pregnancy, heavy clothes or slouched occupant position. The bony pelvis and lumbar spine are the *only* structures in the lower torso capable of taking the up-to-

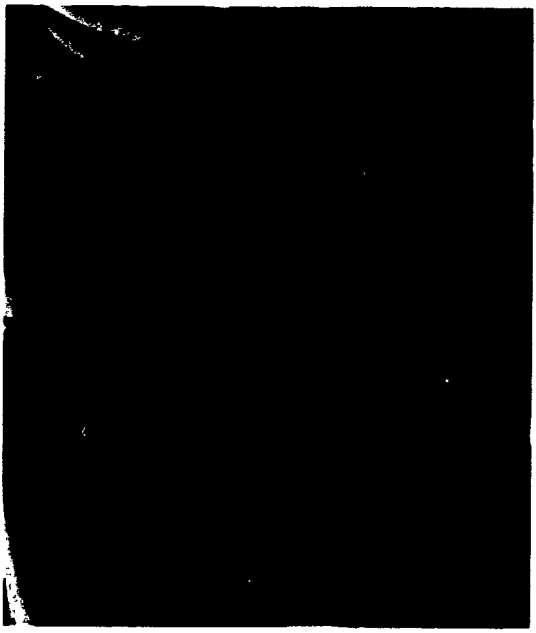


Figure 12

Lapbelts must be positioned over the bony pelvis well below the waist. Only the pelvis can accept the 2000-lb-plus loads which may occur in motor vehicle accidents.

2000-lb load imposed by the belt in more severe head-on accidents. The soft part of the abdomen is not capable of taking loads of this magnitude. Life-threatening injury of the liver, spleen, intestines, kidneys and major vessels may occur.

About 1973, lap-belt anchors were moved forward to more vertically position the lap belt for front seat occupants. This succeeded in keeping the lap belts closer to the thighs, but allowed more forward excursion of the occupant. Similar repositioning of the rear-seat lap belts has not been uniformly achieved because of the higher floor over the rear axle. Cases have been reported of fatal injury to belted rear-seat occupants. Occupants must deliberately place the lap belt on the thighs at the lowest point of the abdomen, so that it will remain over the bony pelvis. This is true for pregnant occupants and obese occupants with large abdomens.

Shoulder belts must always be placed over the shoulder and arm (see Figure 13). Some occupants complain of neck irritation from shoulder belts which rub on the side of the neck. This can be relieved by placing up to 2 inches of slack in the shoulder belt, enough to allow a clenched fist between the shoulder belt and the chest. This can be accomplished by using the release mechanism built into the safety belt retractors of domestic cars or, lacking this, by the use of comfort clips or clothes pins on the belt webbing to prevent retraction. ***Under no circumstances should the shoulder belt ever be placed under the arm against the side of the chest.*** Injuries of the liver, spleen, intestines and major vessels have been reported in accidents which otherwise were of moderate severity. [17]

Summary and Conclusions

Normal aging and pathological changes in the spine and joints of the extremities result in significant impairment for drivers 55+. Degenerative arthritis of the spine and major joints is the most common source of such impairment. Bony and ligamentous joint injuries leading to degenerative arthritis, and muscle weakness and tightness of the aging process also produce impairment for driving. Medical and

surgical therapy can reduce such impairment. The use of anti-inflammatory drugs and various surgical procedures including total joint replacement will sufficiently lessen impairment to permit driving.

The specific roles of the spine and upper and lower extremities of the driving act are examined. Behavioral changes by the driver and the use of standard power options, particularly power steering, power brakes and power seats and special adaptive devices, will permit driving by patients with major musculo-skeletal-system impairments.

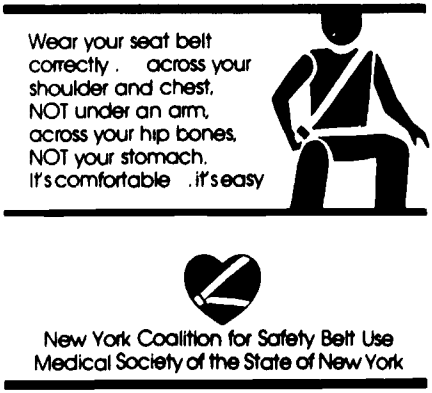
Drivers 55+ are much less resistant to impact injury than younger drivers. Loss of bone mineral, decrease in strength of collagen and other molecular elements of the musculo-skeletal system, decreased muscle strength, and increased stiffness reduce the tolerance of drivers 55+ to impact injury.

Restraint-system design and other motor vehicle occupant-protection designs have focused on the entire driving population. The combination lap and shoulder belt universally used by the motor vehicle industry places excess load concentration on the chest and abdomen and results in injuries which might be avoided by double shoulder-strap systems or other designs. Air bag and other passive-restraint system designs are desirable because of the increased usage rate. Special technical problems may prohibit the use of air bags in subcompact cars. Considerations of cost and serviceability may also preclude the use of air bags.

Seat design is intimately related to safety and comfort. Lower seat-cushion design will prevent submarining of the pelvis from beneath the lap belt and will prevent injury of the soft-tissue contents of the abdomen. Increased stiffness of the lumbar area of the seat back and lateral chest support will significantly reduce fatigue and increase comfort of the motorist's seat. Younger motorists are far better able to tolerate inadequate seat design than drivers 55-and-over. Pain, particularly low back pain, is a significant source of increased fatigue and driver impairment.

Kneebars and seats designed to prevent submarining are the basic elements of passive-restraint systems without air bags and without safety belts. Two-thirds of the body weight can be controlled by using the knees and buttocks as energy input targets. Using an improved test dummy (Hybrid III), in a 90-degree barrier impact, Volkswagen and General Motors have in production two models which meet the federal injury criteria without restraint systems.

Proper use of currently available safety belts is essential to avoid some belt injuries. Serious or fatal injuries can occur from improper use of safety belts: *i.e.*, the shoulder belt under the arm and/or the lap belt over the soft part of the abdomen.



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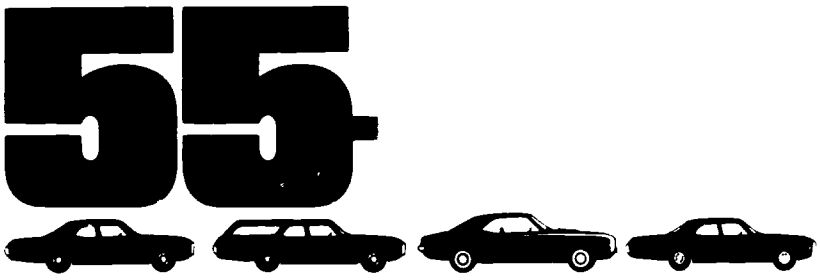

Learning and Motivational Characteristics of Older People Pertaining to Traffic Safety

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Introduction

This paper addresses the learning and motivational characteristics of older people in relation to driving and traffic safety, a subject that has thus far been given little consideration. However, forecasts of ever-increasing numbers of older drivers require that these special characteristics be given attention, for ultimately they must be considered in an overall programming for safer highways.

More Older People

The United States is changing from a nation of young people to a nation of old people. More Americans are living longer; simultaneously the birth rate is decreasing. The baby boom of the 40's has become the senior boom of the present and immediate future. For the first time, the number of Americans over 60 has surpassed the number of youths from age 11 to 19 (U.S. Dept. of Health & Human Services, 1980). This trend is projected to continue through 2050, when people age 65 will outnumber everyone under 18; and by 2080, this senior group will constitute nearly a quarter of the population (U.S. Census Bureau, New York Times 6/24/84). The social and economic implications of this population shift are far-reaching; for transportation administrators they are becoming acute as more and more older drivers are found on our streets and roads.

More Older Drivers

The number of drivers' licenses per 100 population increased by three or more within each major age group in the United States between 1969 and 1978. However, for the age group over 55, the increase was at least 10 licenses per 100 population. At present, of the 141,832,000 licensed drivers in the United States, 25% are 55 and over. The expectation is for 28% by the year 2000, and 39% by 2050. The rate of increase of female drivers is faster than that for male drivers. Between 1969 and 1978 the number

of licenses issued to women over 59 increased 108%. Total licensure increased 58% and only 21% in the 30-59 group, with the estimated ratio of male to female drivers declining from 3:2 to 7:6 (National Traffic Safety Administration, 1979). To repeat, these numbers correspond with demographic trends, and transportation safety officials are faced with a traffic profile and problems different from any previously encountered.

Mobility Needs High

Projections are that older Americans will continue to drive automobiles to satisfy their transportation needs. A movement of population to lower density areas will also reinforce dependence on auto transportation, because public transit is inefficient in these areas (United States Department of Transportation, 1980). This may stimulate the formation of car pools and paratransit operations, but the need to maintain an independent status for older people continues a first priority (established by the Older American Act of 1963). Independence has been and will continue to be linked with personal mobility, and for some older adults the driving privilege is the link to survival.

Driving Changes at 50

A review of the research reveals that most psychomotor declines affecting driving start around age 55, although some may begin as early as 50 (Planek & Overend, 1973). As if in response to these changes, the number of miles driven annually decreases steadily beyond age 50. Moreover, older people drive less at night, in bad weather and in rush hour traffic (Pastalan, 1975). Elderly drivers are not aggressive; they use the accelerator less and the brakes more than younger drivers. When they have a choice, they generally move at a pace they can handle, in deference to their limits. When controlling their own pace, they are able to cope safely with an impending crash situation. But they are often unable to act quickly in a fast-paced situation.

Special Problems

Despite awareness of declining abilities and subsequent modification of driving habits, records reveal that when exposure (in such terms as number of miles driven and the time of day or night they were driven) is considered, older drivers rank next to the worst group, the 16 to 24 year olds, in traffic fatalities (National Safety Council, 1982).

Numerous studies have documented the decline of older drivers' perceptual and psychomotor abilities and have singled out their specific driving problems. For example, drivers over 65 who survive two-car fatal crashes are cited 24% of the time for "failure to yield" (U.S. Department of Transportation, 1984). In the main, their problems involve interaction with the overall traffic flow and their performance in changing lanes, passing, turning and backing (Smith, 1984). In traffic situations requiring rapid reacting and decision making, stimulus overload coupled with perceptual motor problems make older drivers especially vulnerable.

Attention Overdue

In the past, older drivers did not receive attention because there weren't enough of them to make a difference, and the transportation system was less complex. While the current concern is quite sobering, the attention is a *healthful* sign. It is time to recognize that things can be done that will ameliorate some of the problems of older drivers and also make the roads safer for all drivers. Older drivers are not a separate group; they are a subset of the entire driving population. The facts show that much in the transportation environment is unsympathetic and even hostile to their declining perceptual and motor abilities.

First, we have designed and engineered a system for younger users. Streets,

highways, automobiles and communications systems are built for their perception and performance norms, just as communication models for learning and motivation, by and large, have been designed with the young in mind. To accommodate the increasing numbers of older drivers, standards must change and more attention must be given to seniors' safety limits.

Second, through years of engineering improvement, automobiles have become faster, and they have built-in options and controls for decisions that must be made very quickly. But while our interstate highway systems have become faster and safer, many other roads have stayed much as they were fifty years ago. An examination of statistics (Balcar, 1984) disclosed that a large percentage of fatal accidents and the most severe of severe accidents in the U.S. occurred on rural two-lane roads. Although the Highway Safety Act of 1973 accomplished much to improve conditions, much more of the same has to be done for the older driver and the traffic milieu in which he must operate.

Learning and Perception

It is well documented that older people do not perceive as acutely as younger people. Our cognitive processes, how we learn, organize information, remember, think, and are motivated to act are influenced by how we perceive the events and objects in our world (Davis, 1981). Learning and perception are intertwined and essential to driving performance.

Vision

It is estimated that 90% of perceptual clues for driving come through the sense of vision *(Seaton, 1984)*. When we speak of vision we are usually referring to visual acuity — how clear things look, how much detail can be discerned. The distance from the eye at which an object can be seen clearly is known as the near-point of vision. This near-point of vision begins to move away from the eye after age ten; the most profound change in "movement away" occurs between ages forty-five and fifty-five.

The far-point of vision identifies the capacity to distinguish distant objects. At the same time during our life span that the near-point is moving away from the eye, the far point is moving closer. The two actions result in limitations on the range of clear vision as neither details too close nor those too far away can be seen distinctly *(Verner & Davidson, 1971)*. Thus after about age 45 there is a marked decline in visual acuity. When this occurs, it becomes more difficult to distinguish between object and background.

For older eyes, the clearest perceptual image is formed by a sharp contrast between letters or objects and the background. This is as true of far-away road signs as it is of close-up reading materials and indicator on automobile dashboards. A study reported at the U.S. Department of Transportation Hearing on Elderly Driver Issues (1984) indicated that painting an edging stripe on highways, improving signs, increasing the distance ahead that drivers can see, and bettering the alignment of high hazard locations, positively reduced accidents *(Balcar, 1984)*. Attention to improving the perceptual fields paid off.

Accommodation is the ability of the lens of the eye to change shape, and thereby see things up close as well as far away. With aging, the muscles controlling the lens lose elasticity; the ability to focus declines. More time is needed to shift focus from near to distant (and from distant to near) objects. Younger adults can change focus in much less time than persons over forty *(Fozard, et al., 1977)*.

While almost everyone knows there is a decline of accommodation in later life, it is not commonly realized that the loss is gradual, beginning very early in childhood. Most senior adults in a learning situation will be wearing corrective lenses to compensate

for loss of accommodation. However, the ability to read can be much enhanced with large, clear, uncrowded print. Sufficient time should also be allowed for the eye to accommodate from viewing films to reading a blackboard and to writing. The eye also must adjust from reading the speedometer on the dashboard to reading guide signs and route numbers along a road.

Another characteristic of the aging eye is loss of field or peripheral vision. A recent study *(Johnson & Keltner, 1983)* showed the incidence of visual field loss was 3.0% to 3.5% for persons 16 to 60 years old compared to 13.0% for those over 65 years. The authors reported approximately half of those with peripheral visual loss were unaware of the problem. The study further revealed that drivers with visual field loss in both eyes had twice the accident and conviction rate as those with normal field vision. This is convincing evidence that regular eye examinations are very important preventive measures for safe driving.

Illumination is yet another factor in vision. Because of loss of elasticity, the pupil in the normal eye will admit about one-half as much light at 50 years as at 20 *(Fozard, et al., 1977)*. Also, older people have smaller eye pupils than younger people. For normal reading tasks a person age 20 requires 100 watts of illumination; by age 50 this climbs to 180 watts. The additional illumination is needed to compensate for pupillary changes — when too little light reaches the retina, seeing is difficult. Furthermore, merely to see a dim light or object in the dark requires a doubling of the illumination *(McFarland & Fisher, 1955)*. When the older person complains of not being able to see well at night, there is very good reason. Most events for older people should be scheduled for daylight hours. Older drivers need well lighted highways for night driving. Tinted glass windows and sun glasses can be especially hazardous at night as they restrict the amount of light reaching the eye. Those working with older people in reading situations should compensate for the loss of light by increasing external illumination. Better lighting will not only improve prospects for learning, but also decrease the safety hazards associated with inadequate illumination.

Glare is another factor contributing to faulty vision. Sensitivity to glare is slight up to age 40, but increases much more between 40 and 70 years *(Fozard, et al., 1977)*. As the lens of the eye ages, it becomes more opaque and less elastic. It grows without shedding older cells; it just changes shape and becomes thicker. These changes cause light coming into the eye to be scattered, thus increasing problems with glare. The ability to discern detail and to see objects in the face of glare is greatly reduced, and more time is required to recover. Recovery time from the glare of oncoming headlights, or from a reflecting source such as windshields, windows, molding and trim or other sources is critical for safe driving, and for the older eye recovery is slower.

Learning situations should be checked for appropriate attention to the location and type of lighting fixtures, location of windows, seating arrangements and placement of instructural materials. Driver training courses should address such issues as to how best to maintain a visual reference in the face of glare. Roads should be surveyed for lighting that creates a visual hazard. Examples include glaring lights which suddenly appear over a hill or around a curve, causing momentary blindness for a driver. These dangers should be corrected.

Dark adaptation is another visual process negatively affected by aging. It has two dimensions: how long it takes to develop maximum seeing ability, and how good a level eventually is reached. The aging eye is handicapped on both dimensions. The old not only see less well when they become dark adapted, but they take longer than the young to get to their optimum level *(McFarland & Domey, 1960)*. Poor adaptation to the dark has obvious implications for driving or walking safely in night traffic. This characteristic also should be considered when showing films or using other

techniques which require changes in the illumination level of the room. Adequate time to adapt to the new light level is essential.

With aging, the ability to discriminate among colors declines. Colors can be seen very differently by young and old. As the lens of the eye yellows with age, it filters shorter wave length colors — blue, violet, green — and they are less discernible. Longer wave length colors — yellow, orange, red — remain more vivid, clear, and easily seen *(Fozard, et al., 1977)*. Some signs and signals (such as light green signals, lights, or walk signs) are especially difficult for older drivers and pedestrians to see and interpret. Poor color discrimination by older people emphasizes the need to use clear bright colors for automobile dials and indicators as well as for street lights, signs and signals. To improve visual clarity and stimulate interest, instructional mediums should use color well.

Hearing

Hearing impairments rise gradually with age and then increase sharply over age 60. Approximately 19% of persons age 45 to 54 have some hearing problem as compared to 75% in the 70 to 79-year-old age group *(Butler & Lewis, 1982)*. Beginning at 50 years, high tones (soprano) become progressively less audible, while those of lower tones (baritone) are still heard quite well.

It is important to recognize that many older people may be suffering uncorrected hearing loss. In group settings, instructors should be alert for individuals with hearing problems who may need special seating. They may also need encouragement to be tested for a prothesis: many people tend to deny and delay purchase of a hearing aid unless the loss is acute. Certainly, the magnitude of this problem suggests special attention to insure that optimal auditory conditions exist when one is addressing large groups of older people. Communications appears to be best when speakers' voices are distinct but moderately low, and there are no disturbing environmental sounds. Noises that originate from air conditioners, dishes in the kitchen, traffic and other environmental sources not only hinder, but render it impossible for many in an older audience to hear. Screening for hearing impairment should be considered as part of the license renewal process. Deterioration in hearing can contribute to failure to respond to warning sirens, horns, or train whistles. It has been suggested by audiologists that license plates of the deaf be specially marked.

Closely related to hearing is speech perception. With advancing age, intelligibility of someone else's speech decreases. When spoken words follow one another too rapidly, older people lose the meaning, partly because of the additional time required to process information. Sentence comprehension is influenced by the rate at which words are spoken *(Schmitt & McCroskey, 1981)*. While speaking loudly can sometimes compensate for poor intelligibility of fast speech, the compensation is not very successful when spoken rate compresses too many words per minute. Best communication occurs when the speaker faces the audience, speaks at a moderate rate of speed in fairly low tones, and when there are no competing noises.

Learning

The myth that old people cannot learn has been dispelled by research. Even though there are changes in intelligence over a life span, relatively healthy old people show little substantial deficit in the ability to learn *(Davis, 1981)*. What is important is to design instruction with their perceptual and motivational characteristics in mind so that the most effective learning will result.

This may be the appropriate point for a selective review of the findings of significant research (comparing young and old learners) for facilitating the learning process of seniors.

Studies have concluded that for older people learning improves with multiple sensory input — there is more recall of material that can be both heard and seen *(Arenberg, 1976; Arenberg, 1977; Taub & Kline, 1976)*. Thus, combined use of films, take-home pamphlets, discussion periods, handouts, and lectures exerts a positive influence on learning. However, visual stimuli should be simple, as research has found that increased complexity of pictures slows down the aptitude of older people for making correct identification *(Botwinick, 1973; Park et al., 1984)*. This has implications for the design of symbols on road signs.

One study *("Age Effects on Symbol Sign Recognition," Driver Related Issues Subcommittee Hearing On Elderly Driver Issues, 1984)* found that symbol-signs are superior in legibility to equivalent word and number signs. While older drivers appeared to have less current symbol-sign knowledge, they did not have problems learning and retaining such knowledge when they had a chance to study it. They did require more time in processing symbol-sign information, but this was found to be influenced by the composition of the sign. Bold, simple, unique symbol graphics were seen more easily from a distance and led to few errors in recognition. In testing sign colors, white symbols on blue background (as in roadstop services category) were superior to black and red symbols on white background (as in rules and regulation category); however, the researchers cautioned that the type of message conveyed may have been an influence on this finding. It would appear that more research is needed on design, size, composition, color, use of symbols and placement of signs. It follows that drivers' manuals, training and retraining classes should teach symbol identification.

Another study on the readability of state drivers' manual *(Henk, et al., 1984,* using *Fry* and *Flesch* readibility indexes) revealed considerable differences in level of of all State manuals. They range in difficulty from a 6th grade to a 15th grade level with a mean of 10.3. Considering that only approximately 36% of the present cohort group past 65 *has been graduated* from high school, driver's manuals — virtually the only source of formal information about driving laws — are too complex for most of this age group. The study found that many manuals contain unfamiliar words and phrases, legal and technical vocabulary and excessively complex patterns of sentence construction. Sizes and legibility of print, pictures, charts, diagrams ranged from excellent to very poor. The researchers reported that the most common error in format was including too much information per page. Other faults were small print and insufficient space between lines of text. It is apparent that most state driver's manuals have not been designed with older drivers in mind. The overall conclusion is that these manuals should be written for an agreed upon level of reading difficulty. In addition, if they could be designed with the learning characteristics of older people as a guide — considering such things as print size, contrast, color, clarity of information — the result would benefit all drivers.

Another influence on our powers of learning is the rate at which we are able to process information. One investigator compared elderly (60 to 69 years) and young (17 to 35 years) persons across three paired associate pacing rates. The old showed greatest deficiency with the fastest pacing, less deficiency with medium pacing, and least deficiency with self pacing *(Canestrari, 1973)*. Furthermore, in studies *(Eisdorfer, 1975)* of serial learning tasks, it was found that when allowed a longer exposure to stimulus words as well as a longer interval between them, older subjects benefited both from longer inspection times and longer response times. Thus, how well older people learn information depends on the rate at which they receive it and the length of time they have to examine it. When they can set their own pace, conditions for learning improve even more. Applying this to traffic signs, it would follow that signs should be spaced with enough distance to allow the driver to see and decide before taking action.

The complexity of the stimulus can also be an influence on serial learning for senior adults One investigator *(Wallace, 1973)* sequentially presented visual information to an under-30 age group and an over-60 group. With the simple stimulus the performance of the two age groups was almost equal; with increasing complexity of stimuli the older subjects were increasingly slower than the younger in making correct identifications. However, the more time allowed for viewing the stimulus, and the greater the amount of the stimulus exposed, the more both groups were helped, but the older were helped more. This study supports the research on symbol identification. Simple stimuli or configurations, coupled with longer viewing time and greater exposure to the stimulus can appreciably improve identification and sequential integration for older people.

Both the study of visual sequences described above and the speech perception studies described earlier relate to a stimulus persistence theory *(Botwinick, 1974)* — a slowing of the rate of incoming information permits the neural trace to "clear through" and not merge with new inputs, and the older individual is then free to process new information. For example, as said earlier, meaningful speech can become less intelligible for elderly people when the speech is rapid. The longer persistence of the auditory trace of one word or sound in a sentence might interfere with the processing of the next word. (With young people this same thing would happen at more rapid rates of speech.) Discreet, simple stimuli coming in rapid order fuse more readily for the old than for the young. Persisting stimulus traces may be helpful in sequential integration of information when stimuli are simple, but when they are complex, stimulus persistence may interfere with perception. With simple stimuli, the persisting trace may fuse with new traces and be used as a comparison,making for correct perceptions.

This concept has implications for how many messages one sign should contain and how far apart highway messages should be. If they are too complex, they may cause confusion, hesitation and result in an accident. Implications for learning include presenting information in an uncomplicated framework, at an unhurried pace — starting with the less complicated and repeating if necessary. Providing enough time is not just important, it is essential. Complexity of information and rate of presentation have implications for communication and road signs. Older drivers will get the information if it is presented simply and not too quickly. They must be given ample time to make a decision after interpreting the message of the sign.

A number of other procedures have been reported *(Walsh, 1975)* to optimize learning of pair-asociate and serial learning tasks by increasing the efficiency of associative learning machinery. One study *(Canestrari, 1968)* found evidence suggesting that superior performance paired-associate learning occurs when subjects are instructed to form linkages between each word-pair associate. These linkages or mediators may be either verbal symbols or mental pictures. In the study, when both visual and verbal mediators were used by older and younger persons, memory improved and the older doubled their number of corrected responses, whereas those of the younger showed no appreciable change. Teaching and encouraging older people to form mental images, pictures associations to help remember is more successful than using concentration in an effort to memorize material of this type. Studies have shown that young people are more apt to use mediators spontaneously than older people *(Davis, 1981)*.

Other studies *(Botwinick, 1978)* found that older people are less likely to spontaneously use some organizing strategies for learning tasks. When older people were encouraged to use organizers, their scores improved, and when organizing strategies were provided by the researcher, scores improved significantly. Thus, overviews, outlines, lists, reviews, and any type of "cognitive map" or plan improves the performance of older learners.

To summarize, when working with older people to aid communication and learning, it is recommended that information be presented at a fairly slow rate, honoring the learner's own pace. Further, it is best to present a limited amount of material in a single presentation, and to use stimulus configurations which are simple, rather than complex. This applies to either highway signs or instructional materials. Older learners should be taught to use mediators — pictures and word associations — to help memory. How material is organized also relates to how easily and completely it is comprehended. Organizers in the form of lists, outlines, overviews should be completed by the instructor, or the older learner should acquire the skill to develop his own. This same organizational planning helps insure safer road trips. However, for many older people poor learning performance may be a result of low motivation.

Motivation

Studies tend to indicate that while older people are less motivated than younger people to take on a learning task, they will endeavor to learn what is meaningful to them *(Calhoun & Gaunard, 1979)*. Other researchers *(Davis, 1981)* defined meaningfulness for older learners to be that which is concrete and oriented to reality. Thus, to be moved to voluntarily attend driver training or retraining, older drivers must be convinced it has value for them. Implications for instruction would include real-life, "hands on" experiences designed with their learning characteristics in mind.

The training should be held in locations easily accessible to the older driver. The learning environment needs to be one of comfort, mutual trust and respect, helpfulness, freedom of expression, and acceptance of differences. Older learners must perceive the goals of the learning experience to be their goals. If they have a share of responsibility in the planning and operating of the learning experience (*i.e.*, bringing refreshments, bringing a friend, contributing materials) they have a commitment to it. The learning process should make use of the experience of the learners *(Knowles, 1975)* by seeking their participation in it. They should feel secure about discussing driving problems and angers and sharing personal experiences and coping methods.

That older drivers become knowledgeable about their natural decline of perceptual and motor abilities and learn coping strategies and ways to keep themselves in peak mental and physical condition is very important. Other critical information includes current awareness and familiarity with traffic regulatory changes in such areas as, for example, symbol signs, traffic signals, driver licensing examinations, traffic laws, and automobile safety features.

In conclusion, this paper has reviewed learning and motivational characteristics of older drivers and discussed the importance of targeting this growing group for training and retraining courses planned with their characteristics in mind. It also sought to bring attention to ways in which normal aging characteristics influence one's ability to interact with the total traffic environment — signs, signals, lights, markings, roadways and other communications vital to traffic safety. Certainly, all of those involved in the field of transportation, from licensing agencies to highway planners, to vehicle designers and manufacturers, share the responsibility of researching their domains and making necessary changes to help accommodate these characteristics of elderly drivers and consequently make driving safer for all age groups.

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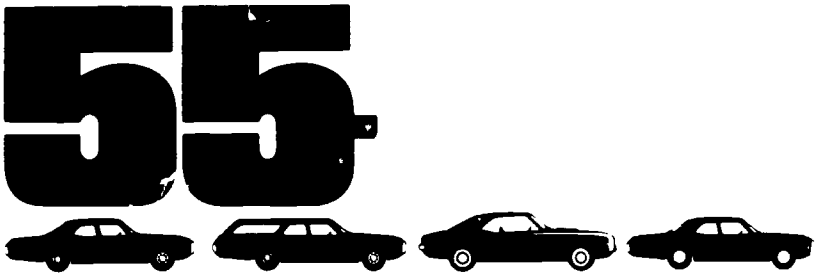

Interaction of Older Drivers With Pedestrians in Traffic

In September, 1973, after a 20-year career with the American Automobile Association's National Headquarter's Traffic Engineering and Safety Department, Mr. Yaksich was appointed Executive Director of the AAA Foundation for Traffic Safety. During his career with the AAA, he worked in various areas of driver and pedestrian safety education, specializing in pedestrian safety. He has published special pedestrian accident studies made in Baltimore, Maryland; St. Louis, Missouri; and St. Petersburg, Florida. As Executive Director of the AAA Foundation for Traffic Safety, Mr. Yaksich is responsible for the research and development of driver and traffic safety education programs, films, and radio and TV public service announcements. He assisted in the field-testing and teacher training of the alcohol and safety programs for senior citizens, elementary, junior and senior high school students, and is responsible for coordinating the Foundation funding activites carried out in conjunction with the Safety Research and Education Project of Teachers College, Columbia University and other universities. Under his direction, the AAA Foundation has broadened its scope of activities to include work in highway transportation of hazardous materials, improving highway guide signing, motorist perception of traffic control devices, and safety implications of vans and big trucks.

Every driver, whether young or old, is at some time also a pedestrian and should, therefore, be interested in the safety of pedestrians in traffic. Older drivers, however, have a much greater concern for pedestrian safety problems because when they themselves are out on foot, they are quickly made aware of the particularly vulnerable situations older persons face in traffic.

In order to adequately discuss future needs of older drivers as they interact with pedestrians, it is necessary to examine pedestrian/vehicle accidents and what is know about the behavior of drivers in such accidents.

Each year in the U.S., some 8,000 pedestrians are killed and 150,000 injured in motor vehicle collisions.[1] These pedestrian/vehicle collisions certainly involve drivers 55 years of age and over as well as drivers of all ages. Very little data, however, is available as to the specific role played by drivers 55 and over in pedestrian accidents. This paper, therefore, will use the limited data available on pedestrian accidents, and must, of necessity, make inferences from related sources. An attempt will also be made to examine the influences of vehicles and highway environments in relation to older driver behavior in pedestrian/vehicle accidents.

TABLE I

Age of Drivers in Pedestrian Accidents
St. Petersburg, Florida 1958-1963

Driver Age Groups	Est. Percentage of Licensed Drivers	Pedestrian Accidents: % of All Drivers in Fatal Accidents	Pedestrian Accidents: % of All Drivers in Injury Accidents
16-19	6	10	7
20-24	5	11	8
25-34	11	11	17
35-44	14	19	14
45-54	13	10	14
55-64	15	8	13
65-74	24 } 51	19 } 35	18 } 39
75 & over	12	8	8

Older Drivers and Pedestrian Accidents

An early study of pedestrian accidents in Baltimore, Maryland, for the period 1953-1958 reported that drivers 55 years and older were involved in 11.8% of all pedestrian fatal accidents and 10.8% of all pedestrian injury accidents.[2] Because no data were available at the time on the ages of the licensed drivers, it was not possible to determine whether older drivers were involved disproportionately in these pedestrian accidents.

A study of pedestrian fatalities in Wayne County, Michigan, published in 1969 by the Highway Safety Research Institute also indicated that drivers 55 and over were involved in 11% of fatal pedestrian accidents.[3] The National Safety Council reported that about this time drivers 55 and over represented 21.5% of all licensed drivers and were involved in 15.6% of *all* fatal accidents and 14.6% of all injury accidents.[4] One could assume, therefore, that older drivers were likely to be slightly under-represented in pedestrian accidents.

Their under-representation was further supported in a study of pedestrian accidents in St. Petersburg, Florida, which showed that although drivers 55 and over comprised 51% of the licensed drivers, they were involved in only 35% of fatal pedestrian accidents and 39% of pedestrian injury accidents *(See Table 1)*.[5]

The average age of drivers in St. Petersburg, Florida is, of course, considerably higher than in most other areas of the country because of the greater proportion of older residents in this region. Another evidence of this factor is the years of driving experience of drivers involved in the St. Petersburg pedestrian accidents. Table 2 shows that over 50% of all drivers in pedestrian accidents had been licensed to drive for at least 25 years.

Older Driver Accident Profile

Before discussing specific actions of older drivers in pedestrian accidents, it is important to review what is known about the accident profile of older drivers. According to a recent study of traffic safety problems of drivers 55 and over financed by the National Highway Traffic Safety Administration ("Elderly Driver Retraining," by James A. McKnight and others at the National Public Safety Research Institute), we have the following general picture of older-driver actions and circumstances in traffic accidents: [6]

TABLE 2
Years of Experience of Drivers Involved in Pedestrian Accidents
St. Petersburg, Florida 1958-1963

Years of Driving Experience	% of Drivers in Pedestrian Accidents
0- 5	14
6-10	10
11-15	9
16-19	6
20-24	9
25-34	15
35-44	25
45 and over	12

- *The majority of older-driver accidents occur under ideal driving conditions, on clear days, straight roads, and dry pavements.
- *Most older-driver accidents occur at intersections within 15 miles of home.
- *The most commonly cited performance errors of older drivers are failure to yield right-of-way; failure to obey signs, signals, markings; careless crossings at intersections, and improper turns (especially left turns).

Several other studies of older-driver behavior in accidents provide additional data.

Ronald R. Mourant in "Driver Performance of the Eiderly,"[7] says that in spite of compensating behaviors by older drivers, accident rates that involve failing to yield right-of-way, improper turning, and ignoring stop signs are higher for older drivers than for middle age drivers.

In a 1982 report from the State of California's Department of Motor Vehicles ("Senior Driver Facts"), we learn that certain types of violations appear to increase with advancing age. Drivers of 70 and over are more often convicted of sign and right-of-way and turning violations, and less often convicted of speeding, equipment and other major violations.[8] In terms of absolute fatal accident risk, the California report says that senior drivers show no over-involvement even at the advanced age of 80. This study also reported that the increased accident rate per mile of travel beginning at ages 55-65 parallels certain age-related declines in psychomotor capabilities.

In a statement to the 1974 National Conference on the Aging Driver, Dr. Robert Nolan of Michigan State University, commented on the difficulty older drivers experience at intersections. He said, "Appearing in Planek's data and ranked high in Bloomfield's study was 'Failure to Yield.' Senior drivers have particular difficulty with intersections in which there is high density. The problem seems to be perceptual overload on the part of the senior driver."[9]

Driver Actions in Pedestrian Accidents

As pointed out earlier, in the Baltimore Study[2] there is some evidence of an increasing involvement of older drivers in pedestrian accidents. But very little information is available to date regarding their *specific actions* in such accidents.

A further analysis of the Baltimore pedestrian data was made by Baker in a report ("Fatal Pedestrian Collisions — Driver Negligence"), which showed that 46% of the

drivers studied were considered to be probably negligent. They either struck pedestrians who were not in the street; or they failed to grant right-of-way to pedestrians crossing with a green light or within a crosswalk where there was no signal; or they were speeding, driving outside the proper lanes, driving at night without lights, racing, etc.[10]

It is evident from the data cited that intersections pose a particular difficulty for older drivers. Intersections also pose a serious problem for older pedestrians — and the two problems are no doubt related to each other.

A number of pedestrian accident studies have revealed that about 7 out of every 10 older pedestrians killed in traffic were struck as they crossed at an intersection in a crosswalk.[5,11] A St. Louis, Missouri study concluded that in adult pedestrian accidents where responsibility could be determined, driver violations, mainly failure to yield right-of-way, exceeded pedestrian violations by almost 2 to 1.[11] This same kind of evidence was found in St. Petersburg, Florida. It showed that older pedestrians were particularly vulnerable to driver error in that, in half of all elderly pedestrian accidents, drivers were charged with failure to yield and that this rate of violation was three times greater than for any other pedestrian age group.[5] Because of the high percentage of older licensed drivers in St. Petersburg, we would have to assume that a significant number of these pedestrian accidents involved older drivers as well.

Older people on foot are particularly vulnerable to turning vehicles. In St. Petersburg, 53% of all elderly pedestrians injured were struck by turning vehicles (*See Table 3*).

The hazards posed to pedestrians by left turning vehicles was clearly portrayed in a study by Phillip A. Habib in Manhattan of one-way street intersections that showed left turn movements to be twice as hazardous to pedestrians as right turn movements.[12] Reasons for this will be discussed under the subjects of vehicle design and highway environmental factors relevant to older drivers and pedestrian accidents.[1]

Vehicle Design, Pedestrian Accidents and Older Drivers

It is estimated that *three* out of every *four* vehicles colliding with pedestrians are passenger vehicles. Twenty-three percent of all pedestrian/vehicle collisions involve trucks.

The exterior design of vehicles has been given major attention, primarily in its relationship to pedestrian injuries. This is evidenced by the many studies discussed in a symposium on the state-of-the-art understanding of "Pedestrian Impact Injury and Assessment" at the 1983 SAE International Congress and Exposition.[13] Because the automobile is one of the principal agents in pedestrian accidents, primary focus of

TABLE 3

Turning Vehicles Pose Problems for Elderly Pedestrians[5]

Vehicle Movement at Time of Accident	% of all Intersection Accidents Involving Elderly Pedestrians
Left Turn	33
Right Turn	20
Backing into Crosswalk	15
Going Straight Through	32

current attention has been naturally directed to changes in vehicle design that would reduce the seriousness of impact on pedestrians. There is evidence that bumper heights, hood ornaments and other exterior design characteristics of vehicles have a direct influence on pedestrian injuries.

In a presentation at the SAE Symposium, researchers from the University of Birmingham, England, stated that if vehicles were designed such that there were no non-minor vehicle contact; head, pelvis, and leg injuries at impact speeds below 40 Kph (24 mph), there would be a reduction of one-third in the number of pedestrians seriously injured when struck by the front of a car or similar vehicles. They went on to state that arguably the benefits of pro-pedestrian car-exterior design — for many countries where pedestrian casualties equal car occupant casualties — are equal to or greater than the benefits of passive restraints or the mandated use of active restraints for vehicle occupants.[16]

In a study prepared for the Department of Transportation, "Accident and Near Accident Causation: The Contribution of Automobile Design Characteristics," we find this statement:

> "It is commonly believed that automobile accidents are almost exclusively due to driver error, obvious exceptions being the result of mechanical breakdowns, such as blowouts, engine failures and so on. However, previous analyses of vehicle designs reveal that specific design characteristics may tend to increase the probability of accidents. For example, automobiles having relatively wide roof posts/pillars may be involved in more accidents than those having relatively narrow posts/pillars because the former provide less visibility to drivers and, therefore, require more frequent head and torso movements of drivers. Thus, while vehicle design may not be directly responsible for accidents, they may very well act as catalysts which tend to alter the magnitude of accident rates."[14]

This report goes on to say that there is relatively widespread belief among human-factors researchers involved in vehicle design that driver/vehicle mismatch problems are at least partially responsible for a significant number of vehicle accidents. Such mismatches occur when some aspect of vehicle design fails to allow for limitations in the driver's capability. Certainly, this is an important area of concern for older drivers.

There is some inferential evidence that vehicle/driver mismatch problems are a factor in pedestrian accidents. This is perhaps most clearly demonstrated in the Habib left-turning vehicle/pedestrian hazard study which points out that visibility from within the vehicle and poor driving habits are responsible for most of the differences between left-turn and right-turn pedestrian/vehicle accidents. That is, the probability of a driver's not seeing a pedestrian is higher on a left-turn than on a right-turn because of the nearly doubled-size blind spots or zones of visibility restrictions created by the A-pillar (left roof support) of a typical vehicle.[12] According to surveys of driver comments on vehicle design, visibility improvements clearly comprised the most frequent class of recommendations.[14] A survey by the British Transport and Road Research Laboratory found "that over 65-year-old drivers are especially at risk at road junctions, particularly when turning right. . . ."[15] Because the British drive on the left side of the roadway, this reaffirms the turning problem of older drivers when they turn across oncoming traffic.

Another vehicle factor related to pedestrian accidents is the evidence that heavier types of vehicles seem to be disproportionately involved in fatal pedestrian accidents. This is true even when considering only automobiles. Larger cars (3501-4100 lbs.) have a pedestrian accident involvement rate almost four times greater than that of

smaller cars weighing less than 2300 lbs.[1] This is a factor relevant to older drivers, since it is they who generally drive larger and heavier cars.

Highway Environment, Pedestrian Accidents and Older Drivers

Highway design and other environmental factors also affect older drivers and their interaction with pedestrians. E.M. Wood, of the Federal Highway Administration, pointed out at the 1983 National Safety Congress, that for the motorist to perform appropriately and safely in the roadway environment, highway design elements must be compatible with driver characteristics. Here again we have a highway/driver mismatch factor that can contribute to older driver accidents, especially those involving pedestrians.[17]

Again, citing intersection locations because of their great significance to older drivers and pedestrian problems, Habib found that traffic-signal placement at intersections can play a significant role in reducing left-turning vehicle pedestrian accidents. With standard mountings of traffic control signals on the right-hand side of an intersection, driver eye movement distances from signal to left turning crosswalk areas must increase as the driver approaches the crosswalk. Older drivers who have greater difficulty in making and continuing these necessarily rapid eye movements are less likely to make correct judgments on the presence of pedestrians in a crosswalk or on their walking speed. Additional traffic signals on the left-hand side of intersections at one-way street intersection crossings can reduce the visual search distance and substantially increase the possibility that a driver will see the pedestrian in the crosswalk during the left-turning movement.[12]

Traffic-sign and signal violations were earlier cited as one of the most frequent errors of older drivers. Studies of driver understanding and recognition of traffic-control devices demonstrate a special need for older drivers. In two analyses of motorist perception of traffic control devices, Hulbert reported that older drivers showed generally less accurate comprehension of traffic control communications than did younger drivers.[18]

Research on the effects of age on traffic-symbol-sign recognition has revealed that differences in initial symbol knowledge were found between each of the driver age groups, and that symbol knowledge began decreasing in advanced age. Recognition-response distance (*i.e.*, the distance from a symbol sign at which it was correctly recognized) decreased significantly with advanced ages. Significant differences were found in response distances between individual symbol signs and between different signing categories such as motorist services, regulatory, etc. Graphical simplicity and certain color combinations improved driver recognition of symbol signs.[19] Safe interaction of older drivers with pedestrians depends heavily on the effectiveness of traffic control signs, signals and markings, particularly at intersections.

Other highway environmental treatments can improve older driver performance, such as roadway and lane delineations[20] as well as better crosswalk markings and indications. The analysis of pedestrian accidents in Baltimore and Washington, D.C., found that removal of street loading zones resulted in a 41% reduction of pedestrian accidents, and that conversion to one-way street operations resulted in a 20% reduction.

FUTURE NEEDS OF OLDER DRIVERS TO IMPROVE INTERACTIONS WITH PEDESTRIANS

The safe and efficient interaction of older drivers and pedestrians will depend upon responsible behavior by pedestrians as well as drivers. Unsafe pedestrian behavior is unquestionably a contributing factor in vehicle/pedestrian collisions.

This paper, however, is intentionally focusing on the older driver and his role in safely sharing roadways with pedestrians.

The future needs of older drivers vis-a-vis pedestrians depends upon three questions: What can be done to make the highway environment safer for older drivers? What can be done with the design of the vehicle to help older drivers be more effective? What can be done through informational and educational programs to help upgrade their driving skills?

Highway Environmental Needs

Officials responsible for planning highway and transportation facilities must give more attention to the special driver characteristics and capabilities of older persons. This means that:

- Traffic signs and signals should be made as large, graphic, simple, and clear as possible.
- With regard to traffic controls, it should be recognized that older people have difficulty with certain colors, and that contrasts in colors are important.
- Advance warning and informational signing should be used more extensively to minimize the number of visual and other perceptual cues that older drivers must seek out in making safe driving decisions.
- More readily visible delineations, and markings, and other communicatons should be provided at pedestrian crossings with heavy vehicular and pedestrian traffic.
- There is need to narrow the wide visual searches and reduce the number of eye movements now required for left-hand turning at intersections. More attention to the positioning of traffic signals at these places would enable drivers more easily to see the signal, monitor the opposing traffic and spot pedestrians in the crosswalk.
- Complicated intersections requiring a high number of driver assessments should be reviewed and simplified whenever possible. Unnecessary highway "furniture," signs, or plantings which interfere with clear view of the intersection should be eliminated to make pedestrians more visible to drivers.

Vehicle Design Needs

The design of vehicles to meet the needs of older drivers has significant implications for pedestrian safety. Obviously older drivers too in buying their vehicles should consider those which are built with a recognition of the unique capabilities and characteristics of the elderly and are designed to reduce the potential injury inpedestrian/vehicle conflicts. Improvements in vehicle design to potential injury in pedestrian/vehicle conflicts. Improvements in vehicle design to enhance older-driver interaction with pedestrians might include:

- Designing a more "forgiving" vehicle, one with an exterior that minimizes the injury to pedestrians in collisions. Hood ornaments or any other exterior features that protrude from the front pose additional hazards to pedestrians.
- Better visibility for drivers ahead and to the side through changes in A-pillar design to reduce blind spots.
- Better coverage of windshield wipers to keep the sides of the windshield free and clear, for these areas are critical to vision in making turns.
- Providing larger and better interior and exterior mirrors to enable older drivers to compensate for decreased abilities to turn the head to check traffic.

- Designing safety restraints that are easy to reach and are flexible enough to permit older drivers to turn the upper part of the body to compensate for decreased head and neck mobility.
- Reducing headlight glare, which is particularly troublesome to older drivers, through possible treatment of windshields.
- Utilizing audible signals in vehicles to warn that a pedestrian is in the approaching crosswalk, thereby alerting older drivers to possible conflicts. Audible signals are now being used to help older and impaired persons to cross at intersections. Traffic signals are being activated for motorists automatically when pedestrians enter a crosswalk. Through an extension of this principle an audible sound in a car would be triggered by the presence of a pedestrian in a crosswalk.
- Providing a simple device to raise the seat level to give older, shorter persons better visibility. Older drivers are generally shorter than younger ones and therefore sit lower in a vehicle. Lower eye-height affects the ability of older drivers to see traffic, especially pedestrians, who often dart out suddenly in front of a moving vehicle. Raising the seat level would help to partially overcome this problem.

Informational and Educational Needs

Older drivers need to be kept abreast of changes and new developments in highway design, environmental controls, laws and regulations, and vehicle design. Up to now, older-driver improvement activities have been developed more from a punitive point of view: to restrict the elderly rather than help them to improve their performance. Some of the informational and educational measures to be considered for older drivers (which may apply to older pedestrians as well) are:

- A more positive and less condescending attitude toward older drivers should be maintained by agencies and officials responsible for traffic and safety efforts.
- Significant changes in laws affecting drivers and pedestrians, such as the Right-Turn-On-Red, should be highly publicized and well communicated to older drivers through special channels leading to the elderly.
- Driver-improvement programs for older persons should contain specific information to make older drivers aware of their responsibilities in regard to pedestrians. Even the newest driver-improvement curriculum recently developed with NHTSA funding does not specifically mention the word *pedestrians* and tell how drivers must act to protect them.
- Older drivers should be taught how to better discriminate important visual and perceptual cues and thus improve perceptual and reaction skills necessary for safely interacting with pedestrians, particularly at intersections and crossings.
- Periodic visual examinations required more frequently with advancing age, should be made at places easily accessible to older drivers. Good vision is essential in all aspects of driving, especially when it comes to interacting with pedestrians.
- Older drivers need to be taught how to compensate for their reduced visual and psychomotor capacities as well as for limitations of vehicular and environmental design which affect safe interaction with pedestrians.

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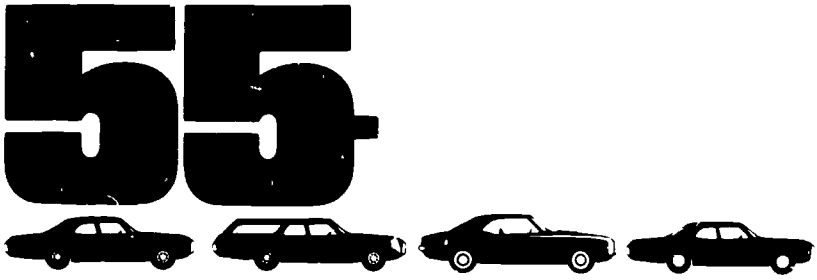

A Survey of the Traffic Safety Needs and Problems of Drivers Age 55 and Over

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INTRODUCTION

The number of elderly people in the population of the United States is on the rise. There are about 33 million drivers age 55 and over, approximately 22 percent of all the licensed drivers on the nation's roadways (National Safety Council, 1984). For them, the license is a key to freedom, independence and mobility, and it can be a major blow to an older driver to lose that license (Butler and Lewis, 1982).

The elderly, like other groups in our society, depend upon travel in order to acquire many of the basic necessities of life: food and clothing, as well as education, employment, and health care. The ability to move from one place to another is also essential for taking part in religious, cultural, and recreational activities, among others. To the extent that the elderly are denied transportation services, they are also denied full participation in meaningful community life (Koncelik, 1982; Schwartz and Peters, 1979).

Among alternative means of transportation, the elderly overwhelmingly prefer the private automobile. For the rural elderly with limited or no access to public transportation there is no other realistic choice.

All but a small fraction of public transportation funds go to highway construction and traffic engineering. But light signals, traffic markings, street signs, and other pedestrian aids are targeted toward the smooth flow of traffic without sufficient, if any, regard to the specific mobility and safety concerns and needs of the elderly—all of which helps to explain why older people constitute a disparately high number of pedestrian deaths and other casualties (Chapman, Wade and Foot, 1982).

While many drivers age 55 and over have commendable driving records, as a group, when exposure is taken into account, they are disproportionately involved in

traffic accidents and fatalities (McFarland, Tune and Welford, 1964; National Safety Council, 1984; Plank and Overend, 1973). In addition, they are more likely than younger drivers to be hospitalized as a result of injuries sustained in traffic accidents (Fife, Barancik and Chatterjee, 1984): those elderly who survive tend to recover slowly (Baker, O'Neill and Karpf, 1984).

PURPOSE OF THE SURVEY

In a joint effort, the AAA Foundation for Traffic Safety and the Safety Research and Education Project (SREP) at Teachers College, Columbia University, conducted an eleven-state survey of drivers 55 years of age and over, designed to assess the mobility and safety of older drivers. The objectives of the survey were to:

1. examine what older drivers *say* about the automobile and related mobility and safety needs and problems;

2. explore how older drivers *feel* about these same needs and problems;

3. compare how they *feel* with what they *say*;

4. assess the implications of the results of this comparison; and

5. suggest ways to address the mobility and safety needs and problems of elderly drivers through appropriate observations and recommendations.

SURVEY METHODS

Data were collected through an Older Driver Survey (ODS) form and a Driving and Connotative Meaning (DCM) form (Williams and Malfetti, 1970; Malfetti, Simon and Williams, 1974) on a sample of drivers age 55 and over residing in eleven states and representing rural, suburban, and urban areas. The ODS form (Appendix A) was developed to examine what older drivers "say" about the automobile and related mobility and safety needs and problems. The DCM form was adapted for the purpose of exploring how they "feel" about these same needs and problems.

Through what is referred to as the Delphi technique, three separate versions of the ODS form were subjected to the collective judgment of a panel of authorities from the fields of gerontology and traffic safety (see List of Panel Members). This method of research was employed in order to "obtain the most reliable consensus... of a group of experts .. by a series of intensive questionnaires interspersed with controlled opinion feedback" (Linstone and Turoff, 1975, p. 10).

The validity of the ODS form was incorporated through the application of the Delphi technique. Furthermore, to ascertain the test-retest reliability of the form, a preliminary version was administered to drivers age 55 and over through the combined auspices of the Tidewater Automobile Association and the Pioneer Kiwanis Club, both of Norfolk, Virginia.

This preliminary version was divided into three parts for test-retest administration and analysis. Part A contained items from Section 1 and 2 of the ODS form; Part B contained items from Section 3 of the ODS form; and Part C contained items from Section 4 of the ODS form. The percentages of perfect agreements for the items are: Part A = 60.87-100.00; Part B = 61.90-100.00; and Part C = 46.67-100.00. Furthermore, the percentages of agreement within one interval (within one answer choice of a multiple choice, ranked order response option) were determined: Part A = 73.91-100.00; Part B = 80.95-100.00; and Part C = 53.33- 00.00.

The items used in the final version of the ODS form were selected on the basis of the following criteria: (1) ratings by authorities using the Delphi technique; (2) content domains on the DCM, form; and (3) test-retest reliability data. The reliability and validity of the DCM form were based on the Semantic Differential technique (Osgood, Suci and Tannenbaum, 1957). In addition, Delphi authorities made

comments and suggestions for clarification and refinement of the DCM form.

The ODS form (21 pages) and DCM form (21 pages) were administered to a non-probability sample of 446 drivers age 55 and over residing in selected communities throughout the country (Appendix B). In order to generalize the results of the survey, a sample was drawn from eleven states (Arizona, California, Connecticut, Florida, Illinois, New York, Pennsylvania, Texas, Virginia, Washington, and Wisconsin) with a representation of urban, suburban, and rural areas within these states, where possible.

While the total size of the sample (N = 446) was relatively small, the length (about two hours) and depth (42 pages) of survey forms necessarily limited the sample size. Within the contraints of the study, the investigators chose a smaller representative sample to probe to greater depth, as opposed to a more cursory survey of a larger sample.

The demographic data collected in the survey showed a close social resemblance between participants and the total national population of persons in the same age bracket. For example, in the survey 64.3 percent were married, while in the entire nation 62.4 percent are married. Also, 28.0 percent of the survey respondents had been graduated from high school compared to 29.5 percent of the population at large (U.S. Senate Special Committee on Aging, 1984).

However, the demographic data gathered by the survey reveals that the sample was a select group in terms of some variables. For example, they were primarily retired persons (86 percent), and thus not representative of older drivers who might still be part of the work force. While an effort was made to make the sample representative of the target population, the demographic data should be carefully examined before making generalizations.

Detailed disaggregated data were collected from the sample of older driver participants so that presentation and analysis of data could include specific age group comparisons stratified on a 5-year interval format (i.e. 55-59, 60-64, 65-69, 70-74, 75-79, 80-84, 85+). Furthermore, similar (adapted) ODS and DCM forms were administered to a sample of drivers age 30-45 (N = 104) as a comparison group. For the purposes of this report, "older drivers" refers to those age 55 and over; "younger drivers" refers to those age 30-45.

Various methods of data analysis included frequency distributions (i.e. frequencies and percentages), central tendency (i.e. mean scores), dispersion (i.e. standard deviation), and relationship (i.e. relating two measures for the same group or one measure for two or more groups). Statistical analysis methods were chosen as appropriate for addressing the objectives posed in the survey. These included analysis of variance, correlation analysis, and contingency table analysis.

SURVEY RESULTS

Older Driver Survey (ODS) Form

Appendix A contains responses by percentages (%) and frequencies (f) to all items in the four sections of the ODS form. The answers address the first question posed in the survey: What do older drivers "say" about the automobile and related mobility and safety needs and problems?

Section 1 (Questions 1-12): Sociodemographic Profile

This section of the ODS form asked for background information and yielded a sociodemographic profile of the older-driver participants. Respondents ranged in age from 55 to 96. Fifty-two percent of the sample were male, 48 percent female. The majority (64 percent) was married, 25 percent widowed, and 10 percent divorced or never married.

Twenty-eight percent have been graduated from high school, 24 percent completed some college, 16 percent have been graduated from college, and 14 percent completed some graduate school. Some were financially independent: 27 percent reported an annual income of $30,000 or more. Twenty-nine percent reported an annual $10,000-$19,999, and 26 percent an annual $20,000-$29,999. Eighty-six percent were retired and/or not working for wages.

Although income level is not the sole determinant of automobile ownership, survey data reveal that it is a major factor for inhibiting ownership among older drivers. Low-income drivers are less able to afford the initial cost of an automobile, and such subsequent costs as gasoline, insurance, maintenance and repairs (National Council on the Aging, 1979).

In general, younger drivers (30-45) were better educated than older drivers (55 and over). Although both older and younger represented middle-income groups, the latter reported higher earnings in the upper wage brackets. In addition, more (58 vs. 44 percent) younger drivers said that they could not live where they do without an automobile.

Among other things, these data suggested that:

—There is an equal proportion of male and female drivers in the older driver population.

—The constituents of this older driver population are sufficiently well educated to respond to classroom driver education courses and/or in-car driver training.

Section 2 (Questions 13-39): Transportation Profile

Answers to questions about transportation circumstances and experiences were requested in this section of the ODS form. Seventy-four percent of the sample had not completed a classroom driver-education course or in-car driver training; nevertheless, 84 percent did not have any difficulty in obtaining (or renewing) a driver's license.

Ninety-eight percent were currently licensed to drive an automobile, and 86 percent had been licensed for over 31 years.

Sixty-two percent owned at least one automobile; 37 percent owned two or more. Ninety percent had easy access to an auto whether they owned one or not. Thus we see a population of active and experienced drivers age 55 and over. Automobile convenience and availability (by whatever means) help to explain why the number of older drivers is increasing.

Other variables are involved in automobile ownership. Price (82 percent), gasoline mileage (59 percent), and injury protection system (30 percent) were thought to be the three most important factors in buying a new car. The three factors said to account for the greatest expense of owning or driving an automobile were gasoline (68 percent), insurance (66 percent), and maintenance and repairs (41 percent).

Fifty-four percent considered themselves "fairly well informed" about what automobile insurance covers and how to buy it, and 28 percent thought they were "very well informed." Eighty-one percent had had at least one automobile insurance claim in the past two years while 18 percent had had two or more in the same period. Ninety percent had never had their automobile insurance cancelled, and eight percent had. Yet various facets of automobile insurance remained a concern of some.

Although the high cost of insurance contributes to the transportation problems of older drivers, the issue goes beyond cost alone. Insurance companies employ such practices as assigning older drivers to costly high-risk groups and cancelling policies automatically because of advanced age. These insurance problems of the elderly were documented in a 1970 report of the U.S. Senate Special Committee on Aging.

According to the ODS, the three main purposes of an automobile include shopping (89 percent), visiting friends and relatives (51 percent), and going to church (41 percent). Sixty-six percent said they drove an automobile daily, 20 percent every other day, and 8 percent once or twice a week. Most (62 percent) drove between 10:01 am-12:00 noon, 56 percent between 2:01 pm-4:00 pm, and 40 percent between 12:01 pm-2:00 pm. Sixty percent of the sample drove at night 16-30 percent of the time, 20 percent drove at night 31-50 percent of the time. Apparently older drivers recognize their limitations and cope by driving at less hazardous times. Specifically, they tend to avoid rush-hour traffic and night driving.

Thirty-four percent said that in the past year they had driven between 5,000-9,999 miles; 28 percent drove between 1,000-4,999 miles, and 18 percent between 10,000-14,999 miles. Some did not drive long distances because it was too tiring (18 percent) or too expensive (13 percent). Hence, the low incidence of accidents of older drivers (55 and over) may reflect the fact that they generally drive less than younger drivers (30-45) and therefore are exposed to fewer possibilities of accident. The majority (80 percent) of ODS respondents did not mind having passengers; most drove with a spouse (55 percent) or with a friend (17 percent). Their spouse (44 percent) or friend (15 percent) drove them when they did not drive themselves.

Public transportation was said to be available (86 percent) and somewhat convenient (57 percent). However, 77 percent rarely or never used it, and 92 percent preferred to drive themselves, have someone drive them (31 percent), or walk (23 percent). These findings support a survey conducted by the U.S. Department of Transportation (1975) which concluded that the automobile is the dominant mode of transportation for older persons and likely to remain so. On ODS, a majority (72 percent) thought they would need to drive every day or every other day five years from now—suggesting a steadily increasing number of drivers in the upper age groups.

Although older drivers have, of course, been licensed longer and had more driving experience (ODS item 15), younger drivers have had more formal classroom driver education and/or in-car driver training (ODS item 13). Younger drivers may even have owned more automobiles than older drivers (ODS item 17), but they also tended to use public transportation more frequently (ODS item 37).

Older drivers had more automobile insurance claims than younger drivers (ODS item 20). (These data contradict findings of previous research, but careful reexamination of raw survey data prove them correct, as reported in Appendix A). One possible explanation may be that older drivers reported more automobile insurance claims related to theft or vandalism than to crashes.

Section 3 (Question 40-81): Driver Profile

This section requested information about conditions and skills necessary for safe driving. From the responses obtained it would seem that the participants possessed relatively good sensory skills. Many reported excellent eyesight (37 percent) or good eyesight (56 percent), with no visual problems (71 percent). Others suffered cataract (10 percent), glaucoma (5 percent), or night blindness (4 percent). Most were required to wear glasses for driving (61 percent); some wore them for seeing in the distance (68 percent); others, for reading (93 percent).

The majority (40 percent) reported that they never had difficulty reading traffic signs or signals before they were too close to do any good; 33 percent "seldom" had difficulty reading them, and 24 percent "sometimes" did. Those who had difficulty with traffic signs (highway or street) mentioned problems with placement of the signs (42 percent), size (17 percent), clarity of lettering (16 percent), and message (13 percent). In addition, difficulty with traffic signs occurred most often on city streets (36 percent) or on freeways through cities (31 percent).

Thirty-five percent sometimes had difficulty seeing while driving at night, 33 percent seldom had such difficulty, and 24 percent "never" had difficulty. Most (75 percent) reported that oncoming headlight glare did not bother them any more or less than it did two years ago; however, twenty percent reported that it bothered them more than it did two years ago. The majority (96 percent) considered clear center-line road markings to be very valuable.

Many reported excellent hearing (32 percent) or good hearing (44 percent); only 8 percent declared that they wore a hearing aid.

Among other things, these findings suggest that drivers age 55 and over recognize their declining visual capacity for nighttime driving. It would appear that clear, center line and side line road markings, which are reflectorized, might be considered in order to promote traffic safety at night for the elderly, indeed for all drivers.

Forty-two percent of the sample reported that they did not drink alcoholic beverages, 33 percent drank wine, 27 percent hard liquor, and 23 percent beer. Twenty-three percent said they rarely drank, 18 percent drank once or twice a week, and 16 percent daily. When they did drink, most (39 percent) usually had only one drink, 21 percent had two, and 6 percent three or more.

Thirty-six percent stated that they never drove soon after drinking alcoholic beverages; 23 percent said they seldom did, and 8 percent "sometimes." Many (21 percent) drove ½ to2 hours after drinking, 13 percent 2 to 4 hours after, and 9 percent 4 hours. Twenty-six percent did not notice a difference in the way they drove after drinking, 8 percent drove more slowly, and 5 percent avoided driving at night after drinking. Surely some older drivers could benefit from a better understanding of their special vulnerability to drinking and driving.

Most respondents (61 percent) did not have either arthritis or rheumatism; 35 percent had arthritis, and 1 percent had rheumatism. Eighty-one percent had never had a joint surgically repaired or replaced; 3 percent have had their knee joint repaired or replaced, 3 percent their hip joint, and 3 percent their fingers.

Eighty-three percent thought that painful or stiff joints never interfered with their ability to drive, 11 percent reported that the joints "seldom" interfered, and 3 percent said "sometimes." If at least one-third of a representative sample of this population suffer arthritis, then surely some of the automotive changes designed to reduce the negative effects of this condition are worthy of consideration.

Because of weak, painful or stiff lower extremity joints, seven percent of the respondents required an automobile equipped with automatic transmission. Nine percent needed an automobile with power steering because of these same difficulties. More, however, (56 percent) did not have any difficulty getting into and out of automobiles, 28 percent reported that it was not "very" difficult, and 14 percent that it was "somewhat" difficult.

Eleven percent admitted to having heart disease, and 25 percent had high blood pressure. Of those suffering these afflictions, 11 percent took medication for the heart, and 24 percent took it for high blood pressure. Seventy percent of the entire sample answered that taking medication did not make driving more difficult for them. Thirty-eight percent had been informed by a physician or pharmacist that their medications might have a harmful effect on their driving, while 32 percent had not been so informed. When almost one-third of a cross-sectional sample of older drivers knows nothing about the influence of their prescription medications on driving, then something is remiss, and an area is wide open for physician/consumer education.

The majority (78 percent) thought the national maximum speed limit of 55 MPH to be just right; 19 percent thought it should be increased, and 2 percent said "decreased." Eighty-six percent did not think it safe to drive far below the posted

speed limit, but 13 percent thought it was safe. Twenty-seven percent said they "always" wore their seatbelts when they rode as passengers, 24 percent wore them "most of the time," 23 percent "sometimes," and 26 percent "seldom" or "never." However, 30 percent forgot to wear their seatbelts as passengers, 22 percent thought them uncomfortable, and 21 percent, "inconvenient." In view of their higher vulnerability to injury and protracted recovery from it, it is unfortunate that a larger percentage of elderly drivers and passengers do not wear their seatbelts more often.

Thirty-eight percent had never read their driver's manual or else had read it more than 4 years ago. Only 33 percent had read their state manual within the last year. Sixty-two percent felt they were fairly well informed about the current rules and regulations in their state, 27 percent felt "very well informed," and 10 percent "not very well" or "not at all" informed.

Forty-two percent had never attended a driver education, training or retraining course, and 16 percent had attended one more than 5 years ago. Eighty percent expressed willingness to take a driver education, training or retraining course. Sixty-four percent felt that older drivers could learn new rules of the road; but most of them (70 percent) agreed that the reaction time of older drivers tended to be slower than that of younger drivers.

Although younger drivers (30-45) reported better performance skills such as sensing (seeing and hearing), deciding what to do, and acting (accelerating, braking, steering), more of them also reported that these driving skills were worsened by alcohol (ODS item 58) or drugs (ODS item 70).

Section 4 (Questions 82 = 128): Driving Profile

Information about some of the actions and conditions necessary for safe driving was sought in this section of the ODS form. Of all the respondents, 91 and 93 percent respectively thought their ability to see and hear in traffic to be about the same as two years ago. The majority used their inside rear-view mirrors (96 percent) and driver-side-view mirrors (88 percent) frequently. Thirty-six percent did not have a passenger-side-view mirror; 27 percent frequently used their passenger-side-view mirror, 16 percent sometimes did, 9 percent seldom, and 8 percent never.

Most (70 percent) did not experience discomfort or pain when sitting in the driver's seat for long periods, but 29 percent did. Forty-seven percent considered it not at all difficult to turn their head and look to the rear when driving or backing up; 29 percent said "not very difficult," and 21 percent "somewhat difficult." The majority (90 percent) did not have any trouble reading the gauges on their instrument panel; 9 percent did. Many (22 percent) had problems with the seatbelt; 8 percent with the heater or air conditioner; 7 percent with the 4-way flasher; 4 percent with the headlight switch. From these figures one can conclude that both the comfort and safety of older drivers need to be considered in the interior design of automobiles.

Many (47 percent) reported that before buying a new car they check on the safety features of various competing makes and models. Sixty-five percent were in favor of a law requiring all drivers and passengers to wear seatbelts, while 33 percent were opposed. Most (33 percent) always wore their seatbelts when driving, 18 percent "most of the time," 21 percent "sometimes," 12 percent "seldom;" and 14 percent never wore it. Many drivers (30 percent) did not wear the seatbelt because they generally forgot to; others found it uncomfortable (21 percent), inconvenient (19 percent), or too hard to put on (10 percent).

As to airbags, there were as many (48 percent) who favored them or other passive restraints as there were who opposed them (48 percent).

Many described their driving ability as worse than it was five years ago under the following conditions: headlight glare (25 percent); night driving (25 percent); when

tired or upset (24 percent); rain and fog (19 percent); rush hour driving (19 percent); long distance driving (18 percent); and snow, sleet or slush (14 percent).

Although most older (55 and over) and younger (30-45) drivers said they would no longer wish to (ODS item 120) or be able to (ODS item 121) drive at about age 80, more (38 vs. 26 percent) older drivers said that no specific age requirement should be mandated for licensing reexamination.

As stated earlier, Appendix A contains complete responses by percentages (%) and frequencies (f) pertaining to all 128 ODS items for older and younger drivers. In addition, chi-square values and levels of significance (p) are given for ODS items with significant differences (.05 or better) between older and younger drivers.

DRIVING AND CONNOTATIVE MEANING (DCM) FORM

The DCM form contains responses to items which address the second question posed in the survey: How do older drivers "feel" about the automobile and related mobility and safety needs and problems?

The DCM form is a research instrument which grew out of studies by Williams and Malfetti (1970) and Malfetti, Simon and Williams (1974). These studies were based on the application of the semantic differential technique (Osgood, Suci and Tannenbaum, 1957). The semantic differential has relatively high validity (measures what it purports to measure). The validity of the semantic differential is .90 or better with the Thurston scales as a criterion measure. The test-retest reliability of the semantic differential is .91 (Osgood, Suci and Tannenbaum, 1957, p. 194). Studies conducted by Malfetti, Simon and Williams (1974, p. 12) confirmed high reliability estimates for the semantic differential.

In the present survey, twenty noun concepts (Table 1) were selected for use in the DCM form. These DCM noun concepts were selected to correspond to the various items on the ODS form. The noun concept at the top of each page was followed by twelve bi-polar, seven-position adjective scales representing four semantic dimensions. Some of these adjective scales were reflected (reversed) to minimize skewing of responses.

When this particular format is used (one noun concept followed by all adjective scales), the ordering of the noun concepts is immaterial and will not affect the results (Heise, 1970, p. 240). This premise was tested and substantiated in the survey through the administration of four color-coded DCM forms, each of the different color-coded DCM forms representing a change in the sequence of the DCM noun concepts.

Noun concepts are represented by four semantic dimensions. These include: (1) evaluative—reflecting the extent to which an individual likes or dislikes a noun concept; (2) activity—reflecting movement, rate of change, or degree of dynamism of a noun concept; (3) potency—representing power, resilience, or toughness of a noun concept; and (4) stability—reflecting feelings about the noun concepts that are unsettling or undesirable (Malfetti, Simon and Williams, 1974, pp. 1-2).

In the present survey, each of the four semantic dimensions is represented by three adjective scales. Each bi-polar adjective scale consists of seven positions ranging from one adjective extreme (1) to another (7), with the middle position (4) representing neutral. Hence, DCM scores range from 1-21 for each semantic dimension. Each of the adjective scales for any given noun concept was scored as marked in one of the seven positions. If the scale was left blank or if there was more than one response, the semantic dimension was not scored.

From the information obtained through the DCM form for older drivers, the participants responded with the lowest DCM scores on the activity dimension when compared with the other three semantic dimensions (Table 2). This implies lower

TABLE 1

LISTING OF TWENTY DCM NOUN CONCEPTS

CONTENT DOMAIN #	DCM NOUN CONCEPT
1	Automobile Design and Comfort
2	Automobile Insurance
3	Being Able To Drive
4	Compulsory Driver Licensing Reexamination
5	Drinking and Driving
6	Driver Improvement Course
7	Driver's License
8	Driving After Taking Drugs
9	Driving At Night
10	Highway Design
11	Highway Signs and Signals
12	My Skill As A Driver
13	Myself
14	Myself Five Years From Now
15	Other Drivers
16	Owning An Automobile
17	Physical and Medical Condition
18	Public Transportation
19	Seatbelts
20	Traffic Accidents and Violations

activity which then reflects less movement, rate of change, or degree of dynamism from responses to noun concepts.

Four exceptions to low DCM scores on the activity dimension occur for the following DCM noun concepts: Drinking and Driving, Driving After Taking Drugs, Other Drivers, and Traffic Accidents and Violations. Hence, these findings suggest that there is more movement, rate of change, or degree of dynamism from responses to these four noun concepts.

From the information obtained on the evaluative dimension through the DCM form, the noun concepts with lower DCM scores which then indicate a lower evaluation include: *Drinking and Driving, Driving After Taking Drugs, Driving At Night, Other Drivers*, and *Traffic Accidents and Violations*. Hence overlapping noun concepts indicate specific concerns and problems that older drivers themselves "feel" should be addressed in order for them to continue to drive safely in traffic.

COMPARISON OF ODS AND DCM SCORES

In an attempt to address the third objective of the OD survey (to compare how drivers age 55 and over "feel" with what they "say" about the automobile and related mobility and safety needs and problems) ODS items were grouped under corresponding DCM noun concepts (Table 3). Then a problem score (derived from high-risk factors) was created from responses to ODS items. This score was based on

TABLE 2

SUMMARY OF DCM SCORES

DCM Noun Concept*	Semantic Dimension Mean Scores			
	Evaluative	Activity	Potency	Stability
1	16 3	11 0	13 3	13 0
2	16 8	10 4	13 8	13 8
3	17 7	10.7	14 3	15 7
4	16 3	10 2	13 5	14 4
5	8 4	10 6	8 5	6 8
6	17 4	10 7	13 8	15 0
7	17 9	10 8	13 9	15 7
8	8 3	10 0	8 3	6 6
9	12 2	9 5	11 0	12 4
10	15 5	10 7	12 2	12 0
11	16 4	10 6	13 4	13 2
12	17 4	10 1	13 7	16 0
13	16 9	10 3	14 0	16 6
14	15 4	9 2	12 6	14 8
15	12 8	11 4	11 2	10 7
16	17 1	10 7	13 7	15 1
17	17 0	10 5	13 7	15 2
18	14 8	9 8	12 2	12 0
19	17 4	10 9	14 3	15 4
20	10 8	10 9	10 5	9 3

* See Table 1 for listing of twenty DCM noun concepts

the literature review, survey findings, and judgment of the investigators.

For example, ODS items 53, 54, 55, 56, 57, 58 and 105 were grouped under the DCM noun concept Drinking and Driving. Then selected responses to each of these ODS items were used in determining a problem score (Table 4). An appendix revealing how problem scores were determined by DCM noun concepts and related ODS items is at this writing, available from the Study Team.

The problem scores for overlapping DCM noun concepts *Drinking and Driving, Driving After Taking Drugs, Other Drivers* and *Traffic Accidents and Violations* were examined. The mean problem scores for each of the noun concepts are: Drinking and Driving = .9; Driving After Taking Drugs = .8; Other Drivers = .3; and Traffic Accidents and Violations = 1.2. We conclude that older drivers themselves did not "say" these noun concepts represented specific concerns and problems that should be addressed in order for them to continue to drive safely.

While older drivers generally "say" what they "feel," there are some exceptions. This comparison between the DCM scores and problem scores is important because it suggests that how drivers age 55 and over "feel" about Drinking and Driving, Driving After Taking Drugs, Other Drivers, and Traffic Accidents and Violations is not what they "say."

TABLE 3

DCM NOUN CONCEPTS AND RELATED ODS ITEMS

CONTENT DOMAIN #	NOUN CONCEPT	SURVEY ITEM #	TOTAL #
1	Automobile Design and Comfort	30, 62, 63, 54, 87, 89, 90, 96, 112	9
2	Automobile Insurance	18, 19, 20, 21	4
3	Being Able To Drive	10, 24, 25, 26, 27, 38, 122	7
4	Compulsory Driver Licensing Reexamination	75, 76, 122, 123, 124, 126, 127, 128	8
5	Drinking and Driving	53, 54, 55, 56, 57, 58, 105	7
6	Driver Improvement Course	13, 77, 78	3
7	Driver s License	13, 14, 15, 16, 41, 75, 76, 125, 126, 127, 128	11
8	Driving After Taking Drugs	68, 69, 70	3
9	Driving At Night	28, 29, 48, 49	4
10	Highway Design	80, 100, 101, 102	4
11	Highway Signs and Signals	45, 46, 47, 100, 101, 102, 114	7
12	My Skill As A Driver	28, 29, 79, 80, 81, 82,83, 84, 85, 86, 97, 99, 100, 101, 102, 111, 112, 116, 117, 118, 121	21
13	Myself	1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 31, 116 117, 118, 119, 120	17
14	Myself Five Years From Now	39, 118, 119, 120, 121	5
15	Other Drivers	32, 33, 34, 113	4
16	Owning An Automobile	6, 17, 22, 23, 24, 95	6
17	Physical And Medical Condition	28 29, 40, 41, 42, 43, 44, 48, 49, 51, 52, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 82, 83, 87, 88, 89, 90, 98, 112	29
18	Public Transportation	35, 36, 37, 38	4
19	Seatbelts	71, 72, 91, 92, 93, 94, 95, 109, 110	9
20	Traffic Accidents And Violations	20, 73, 74, 103, 104, 105, 106, 107, 108, 109, 110, 115	14

Implications of This Comparison

In order to address the fourth objective of the survey (to assess the implications of the results of the comparison between how drivers aged 55 and over "feel with what they "say" about their mobility and safety needs and problems) significance was computed, comparing groups with various levels of problems on the four semantic dimensions for the twenty DCM noun concepts. Levels of significance at .05 or better for these are reported below. Means, standard deviations, analyses of variance and univariate F-ratios comparing groups with various levels of problems on semantic dimensions for DCM noun concepts are contained in an appendix available from the Study Team. The sample size of these analyses of variance differ because of semantic dimensions that could not be scored since fewer than three bi-polar adjective scales were marked by some respondents.

The differences for the sample groups were tested, using a median split (upper half problem scores vs. lower half problem scores). Four exceptions occur for the following DCM noun concepts: *Automobile Insurance, Myself Five Years From Now, Other Drivers* and *Public Transportation.* These were analyzed differently because of skewed frequency distributions.

In a total of 80 possible comparisons (20 noun concepts X 4 semantic dimensions) 54 showed substantial agreement between DCM and ODS scores (Table 5). These data suggest that the DCM form is useful as a validity measure of the ODS form: in general, older drivers "say" what they really "feel" about their mobility and safety.

TABLE 4

DETERMINATION OF PROBLEM SCORE BY DCM NOUN CONCEPT
DRINKING AND DRIVING

53. WHAT ALCOHOLIC BEVERAGES DO YOU USUALLY DRINK? (YOU MAY CHECK MORE THAN ONE)	[ ]	BEER
	[ ]	WINE
	[ ]	HARD LIQUOR
	[ ]	NONE (SKIP TO QUESTION 59)
54. HOW OFTEN DO YOU DRINK ALCOHOLIC BEVERAGES?	or [X]	MORE THAN ONCE DAILY
	[ ]	EVERY DAY
	[ ]	EVERY OTHER DAY
	[ ]	ONCE OR TWICE A WEEK
	[ ]	ONCE OR TWICE A MONTH
	[ ]	RARELY
55 WHEN YOU DRINK, HOW MUCH DO YOU USUALLY HAVE?	[ ]	ONE DRINK
	[ ]	TWO DRINKS
	[ ]	THREE DRINKS
	[X]	FOUR DRINKS OR MORE
56. DO YOU DRIVE SOON AFTER YOU HAVE BEEN DRINKING?	[ ]	NEVER (SKIP TO QUESTION 59)
	[ ]	SELDOM
	or [X]	SOMETIMES
	[X]	FREQUENTLY
57. HOW SOON AFTER DRINKING DO YOU USUALLY DRIVE?	or [X]	LESS THAN 1/2 HOUR
	[ ]	1/2 TO 2 HOURS
	[ ]	2 TO 4 HOURS
	[ ]	4 TO 8 HOURS
	[ ]	AFTER 8 HOURS
58. IN WHICH WAY DO YOU NOTICE THE MOST DIFFERENCE IN THE WAY YOU DRIVE AFTER DRINKING?	or [X]	NO DIFFERENCE
	or [ ]	I MAKE MORE MISTAKES
	[ ]	I DRIVE SLOWER
	[ ]	I DO NOT PASS OTHER CARS AS OFTEN
	[ ]	I AVOID DRIVING AT NIGHT
	[ ]	OTHER: _____ (DESCRIBE)
105. HOW MANY TIMES HAVE YOU BEEN ARRESTED FOR DRIVING WHILE INTOXICATED (DWI)?	[ ]	NEVER
	[ ]	ONE
	or [ ]	TWO = 3 points
	[ ]	THREE
	[X]	FOUR OR MORE = 5 points

X = problem = 1 point except where otherwise indicated

However, 26 comparisons (Table 6) indicated significant differences ($p<.05$ or better): 18 comparisons were in the positive direction, and 8 in the negative direction.

Of noteworthy interest among the noun concepts showing differences are those where the mean scores are higher when they should be lower for the high-problem groups. These comprise the following noun concepts and associated semantic dimension:

Drinking and Driving: Potency, Stability

Driving After Taking Drugs: Evaluative, Activity, Potency, Stability

Myself: Evaluative

Myself Five Years From Now: Potency

These data suggest that participants were not "saying" what they really "felt" regarding these particular noun concepts.

Furthermore, the relationship between problem score and age is significant at the .05 level. Figure 1 shows a direct relationship between age and problem score; the

TABLE 5

SIGNIFICANT[1] AGREEMENTS BY NOUN CONCEPT AND SEMANTIC DIMENSION

DCM Noun Concept[2]	Semantic Dimension[3]
1	Evaluative
1	Potency
1	Stability
2	all four
3	all four
4	all four
5	Evaluative
5	Activity
6	Activity
7	all four
9	Activity
9	Stability
10	all four
11	Activity
12	Evaluative
12	Activity
12	Potency
13	Activity
13	Potency
13	Stability
14	Evaluative
14	Activity
14	Stability
15	all four
16	all four
17	Activity
19	all four
20	Activity
18	Activity
18	Potency

[1] $p > .05$ or better

[2] See Table 1 for listing of twenty DCM noun concepts

[3] Evaluative, Activity, Potency, or Stability

TABLE 6

SUMMARY OF SIGNIFICANT OCM AND PROBLEM SCORE COMPARISONS

DCM Noun Concept*	Semantic Dimension	Direction
1	Activity	Positive
5	Potency	Negative
5	Stability	Negative
6	Evaluative	Positive
6	Potency	Positive
6	Stability	Positive
8	Evaluative	Negative
8	Activity	Negative
8	Potency	Negative
8	Stability	Negative
9	Evaluative	Positive
9	Potency	Positive
11	Evaluative	Positive
11	Potency	Positive
11	Stability	Positive
12	Stability	Positive
13	Evaluative	Negative
14	Potency	Negative
17	Evaluative	Positive
17	Potency	Positive
17	Stability	Positive
20	Evaluative	Positive
20	Potency	Positive
20	Stability	Positive
18	Evaluative	Positive
18	Stability	Positive

* See Table 1 for listing of twenty DCM noun concepts

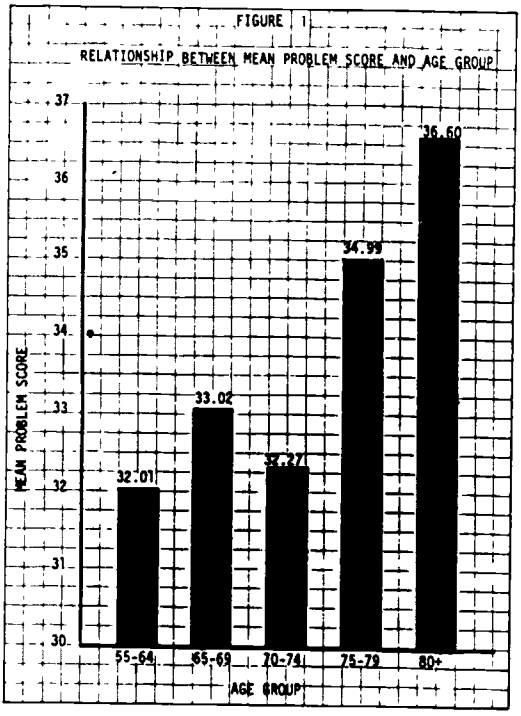
older the driver the greater the problem. Of added interest is that the problem score seems to escalate at age 75-79. Moreover the relationship between problem score and sex is significant at the .001 level. Male drivers seem to have more automobile and related mobility/safety problems than female drivers.

Comparison of Older and Younger Drivers: Significant Differences By DCM Noun Concept and Semantic Dimension

Means, standard deviations, analyses of variance nad univariate F-ratios comparing older drivers (55 and over) and younger drivers (30-45) with various levels of problems on semantic dimensions for DCM noun concepts are contained in another appendix available from the Study Team. The comparisons which were significant at .05 or better are summarized in Table 7. The sample size of these analyses of variance differ because of semantic dimensions that could not be scored since fewer than three bi-polar adjective scales were marked by some respondents.

Correlation Matrices for Problem Predictions Based on DCM Noun Concepts

Correlation matrices for the twenty DCM noun-concept problem scores and total problem scores were computed and reported in another appendix, available at



present from the Study Team. These correlations were tabulated in order to determine if any relationship exists between any one of the twenty DCM noun-concept (Table 1) problem scores with other DCM noun-concept problems scores or total problem score. The correlations of most interest are those between the twenty DCM noun concept problem scores and the total problem score (Table 8). Correlation matrices were computed for the older driver (55 and over) sample as a whole (N = 446) as well as for seven groups of five-year aggregates (i.e. 55-59, 60-64, 65-69, 70-74, 75-79, 80-84 and 85-96). For comparison, a correlation matrice was tabulated for the younger driver (30-45) sample as a whole (N = 104). In all cases, only correlation coefficients of .40 or better were identified as problem predictors.

For all drivers of 55 and over (N = 446), the best predictors of total problem scores are those for the following DCM noun concepts: Automobile Design and Comfort (.43), Driving At Night (.42), Highway Signs and Signals (.41), My Skill As A Driver (.63), Physical and Medical Condition (.66), and Seatbelts (.53). In general, these DCM noun concept problem scores have higher means than the others.

For drivers aged 55-59 (N = 14), the best predictors of total problem scores are those for the following DCM noun concepts: Automobile Insurance (.49), Driving At Night (.70), Highway Signs and Signals (.58), My Skill As A Driver (.85), Owning An Automobile (.47), Physical and Medical Condition (.84), Public Transportation (.46) and Traffic Accidents and Violations (.51).

For those aged 60-64 (N = 81), the best predictors of total problem scores are those for the following DCM noun concepts: Automobile Design and Comfort (.40), Driving At Night (.53), My Skill As A Driver (.66), and Physical and Medical Condition (.67).

TABLE 7

A COMPARISON OF DRIVERS 55+ AND THOSE 30-45
SIGNIFICANT DIFFERENCES BY NOUN CONCEPT AND SEMANTIC DIMENSION

OCM Noun Concept*	Semantic Dimension	Direction
1	Potency	Negative
1	Stability	Negative
3	Stability	Negative
4	Evaluative	Negative
4	Potency	Negative
6	Evaluative	Negative
6	Potency	Negative
6	Stability	Negative
7	Evaluative	Negative
7	Potency	Negative
7	Stability	Negative
10	Evaluative	Negative
10	Potency	Negative
10	Stability	Negative
11	Potency	Negative
11	Stability	Negative
12	Activity	Positive
13	Activity	Positive
14	Evaluative	Positive
14	Activity	Positive
14	Potency	Positive
14	Stability	Positive
15	Evaluative	Negative
15	Activity	ative
15	Potency	Negative
16	Evaluative	Negative
16	Activity	Positive
16	Potency	Negative
16	Stability	Negative
17	Activity	Positive
18	Evaluative	Negative
18	Activity	Negative
18	Potency	Negative
18	Stability	Negative
19	Potency	Positive
20	Evaluative	Negative
20	Potency	Negative
20	Stability	Negative

* See Table 1 for listing of twenty OCM noun concepts

TABLE 8

CORRELATIONS BETWEEN DCM NOUN CONCEPT PROBLEM SCORES AND TOTAL PROBLEM SCORES BY AGE[1]

DCM NOUN CONCEPT- CONTENT DOMAIN #[2]	AGE GROUP 55-59 N= 14	60-64 N= 81	65-69 N=117	70-74 N=110	75-79 N= 73	80-84 N= 38	85-96 N= 10	Total N=446	30-45 N=104
1	.49	.40	.46	.56	.35	.17	.26	.43	31
2	0	.26	.10	.06	.32	.15	.51	.18	03
3	.44	.24	.17	.11	.30	.29	.09	.16	22
4	- 29	.26	.35	34	.29	.08	-.07	.28	09
5	.24	.17	.38	.21	.34	24	-.14	.24	36
6	-.07	.25	.32	.19	.23	- 18	-.02	19	23
7	-.53	34	.46	.33	26	.13	.37	.34	32
8	.12	.19	.25	.20	.22	.35	.54	.26	31
9	.70	.53	.38	.37	.48	.60	.17	.42	53
10	.18	.21	.38	.26	.24	.59	.44	.29	25
11	.58	.37	.47	.43	.40	.50	.27	.41	24
12	.85	.66	.71	.53	.55	.69	.66	63	57
13	.26	.24	.28	24	.29	.31	- 29	.30	24
14	.04	.06	.22	.18	.21	.11	.05	.19	25
15	0	.19	-.01	.08	-.08	-.08	-.45	.01	47
16	.47	.36	.32	.20	.30	.36	-.27	29	37
17	84	.67	.69	.65	.64	.59	.60	66	66
18	.46	-.08	.18	.16	.03	-.01	.37	.11	23
19	.20	.25	.65	.60	.45	.67	.45	.53	57
20	.51	.18	.38	.25	.53	.24	40	.34	42

[1] The higher the coefficient, the better the DCM noun concept and related ODS items predict total problem

[2] See Table 1 for listing of twenty DCM noun concepts

For drivers aged 65-69 (N = 119), the best predictors are problem scores for the following concepts: Automobile Design and Comfort (.46), Driver's License (.46), Highway Signs and Signals (.47), My Skill As A Driver (.71), Physical and Medical Condition (.69), and Seatbelts (.65).

For those aged 70-74 (N = 110), the best predictors of total problem scores are for the following concepts: Automobile Design and Comfort (.56), Highway Signs and Signals (.43), My Skill As A Driver (.53), Physical and Medical Condition (.65), and Seatbelts (.60).

For drivers aged 75-79 (N = 73), the best predictors of total problem scores are those for: Driving At Night (.48), Highway Signs and Signals (.40), My Skill As A Driver (.55), Physical and Medical Condition (.64), Seatbelts (.45), and Traffic Accidents and Violations (.53).

For those aged 80-84 (N = 38), the best predictors of total problem scores are those for the following DCM noun concepts: Driving At Night (.60), Highway Design (.59), Highway Signs and Signals (.50), My Skill As A Driver (.69), Physical and Medical Condition (.59), and Seatbelts (.67).

TABLE 9

CORRELATIONS BETWEEN ODS ITEM PROBLEM SCORES AND TOTAL PROBLEM SCORES BY AGE *

55 - 59 N= 14		60 - 64 N= 81		65 - 69 N= 117		70 - 74 N= 110		75 - 79 N= 73		80 - 84 N= 38		85 - 96 N= 10	
2	.53	49	.50	71	.54	90	.50	44	.57	58	.42	16	.48
6	.43	97	.44	72	.47	92	.52	57	.47	71	.41	24	.43
10	.87			82	.41			72	.41	72	.60	37	.78
27	.62			91	.48			97	.40	89	.58	49	48
35	.42			92	.46			109	.40	91	.47	52	.47
40	.42			93	.40					92	.62	59	.68
45	.69			114	.40					97	.48	68	.59
46	.49									102	61	83	.55
49	.42									116	.52	88	.41
52	69									117	.52	91	.62
78	.54											92	.40
82	.87											93	.47
87	.47											97	51
89	.78											126	.45
97	.62												
105	.69											30 - 45 N= 104	
112	.65											109	41

* See Appendix A for listing of 128 ODS items

For drivers aged 85-96 (N = 10), the best predictors of total problem scores are problem scores for the following DCM noun concepts: Automobile Insurance (.51), Driving After Taking Drugs (.54), Highway Design (.44), My Skill As A Driver (.66), Physical and Medical Condition (.60), Seatbelts (.45), and Traffic Accidents and Violations (.40).

For all drivers aged 30-35 (N = 104), the best predictors of total problem scores are those for the following DCM noun concepts: Driving At Night (.53), My Skill As A Driver (.57), Other Drivers (.47), Physical and Medical Condition (.66), Seatbelts (.57), and Traffic Accidents and Violations (.42).

Correlation Coefficients for Problem Predictions Based on ODS Items

Correlation coefficients for ODS-item problem scores and total problem scores were computed to determine if any relationship existed between any one of the ODS item problem scores and total problem score. Correlation coefficients were tabulated for seven five-year age groups in Table 9 (i.e. ages 55-59, 60-64, 65-69, 70-74, 75-79, 70-84, 85-96). In addition, correlation coefficients were computed for the younger driver sample as a whole for comparison with older drivers. In all cases, only correlation coefficients of .40 or better were identified as possible predictors of problems.

Older Driver Age Group Comparisons: Significant Differences By ODS Items

The members of the Study Team selected ODS items which they thought worth

TABLE 10

CHI-SQUARE (x^2) AND LEVEL OF SIGNIFICANCE (p) BY FIVE AGE GROUPS FOR ODS ITEM 27

"HOW MANY MILES HAVE YOU DRIVEN IN THE PAST YEAR?"

	ITEM RESPONSES										
AGE GROUP	less than 1,000 mi		1,000 - 4,999 mi		5,000 - 9,999 mi		10,000 - 14,999 mi		15,000 mi or more		TOTAL
	f	%	f	%	f	%	f	%	f	%	
55 - 64	5	5 5	16	17 6	32	35 2	17	18 7	21	23 1	91
65 - 69	5	4 2	28	23 7	50	42 4	23	19 5	12	10 2	118
70 - 74	9	8 5	32	30 2	31	29 3	29	27 4	5	4 7	106
75 - 79	9	12 7	21	29 6	26	36 4	8	11 3	5	7 0	71
80+	4	8 9	26	57 8	10	22 2	5	11 1	0	0	45
TOTAL	32		123		151		82		43		431

x^2 = 60 04

p < 001

investigating for possible differences in terms of needs and problems by different older-driver age groups. Thirty-eight items were selected. Chi-square analyses were computed for these ODS items using five older-driver age group comparisons (i.e., 55-64, 65-69, 70-74, 75-79, 80+), where possible. Of these items, nine were significant at .05 or better and are described below. Although other items were not statistically significant, they showed a trend that was anticipated: direct relationship between increasing age and number and degree of problems.

For ODS item 27 (Table 10 is an illustration of how the items selected were analyzed) there is an evident drop in the number of persons aged 70 and over who drive 15,000 miles or more per year. In ODS item 44D ("Do you have any of these visual problems [night blindness]?"), X^2 analysis was computed with only two age groups: drivers 75 and over and those 74 and under because of the large proportion of expected frequencies fewer than five. On the basis of this analysis ($X^2 = 9.61$, $p = <.01$), it was shown that drivers aged 75 and over had significantly more visual problems resulting from night blindness. In ODS item 44F ("Do you have any of these visual problems [none of the above]?"), $X^2 = 14.77$, $p = <.01$) indicated a direct relationship between age and visual problems; the older the driver, the greater the visual problems.

For ODS item 72 ($X^2 = 10.75$, $p = <.05$), "What do you think about the national maximum speed limit of 55 MPH?" more (91 vs. 76 percent) drivers aged 80 and over were satisfied with the present national maximum speed limit of 55 MPH. In ODS item 89 ($X^2 = 11.81$, $p = <.05$), "Do you have any trouble seeing or reading the gauges on your instrument panel?", drivers aged 55-64 (18 percent) showed they had a greater problem seeing or reading the gauges on their instrument panel than those aged 80 and over (10 percent).

For ODS item 97 ("Please indicate whether your driving ability is better, about the same, or worse than five years ago"), statistically significant responses included: (A) night driving ($X^2 = 20.70$, $p = <.01$), (F) interstate (freeway) driving ($X^2 = 21.75$, $p = <.01$), (I) when tired or upset ($X^2 = 20.18$, $p = <.01$), and (L) holiday or vacation driving ($X^2 = 21.77$, $p = <.01$)."

In ODS item 97A, 22 percent of drivers aged 55-64 indicated that they were worse night drivers while 41 percent of those 80 and over said that they were worse night drivers.

While 91 percent of drivers aged 55-64 thought they were better or about the same on interstate driving (ODS item F), a lower 77 percent of drivers aged 75-79 and a still lower 63 percent of those aged 80 and over thought so. In addition, 3 percent of drivers aged 55-65 thought they were worse than five years ago on interstate (freeway) driving; and 13 percent of drivers aged 75-79 and 22 percent aged 80 and over thought they were worse.

In ODS item 97I, 32 percent in the age 55-64 group felt that they were worse drivers when tired or upset while 23 percent in the group who were 80 and over said this applied to them. For ODS item 97L, many more drivers aged 75-79 (8 percent) and 80 or more (13 percent) said that they were worse drivers under holiday or vacation circumstances.

SUMMARY

This survey was conducted in order to learn more about the specific mobility and safety needs and problems of older drivers. Data were collected through an Older Driver (ODS) form and a Driving and Connotative Meaning (DCM) form on a sample of 446 drivers age 55 and over (M = 232, F = 214) residing in eleven states representing rural, suburban, and urban areas.

While older drivers generally "say" what they "feel," there were some exceptions. The DCM form was adapted specifically for the purpose of exploring how older drivers "feel" about the automobile and related mobility and safety needs and problems. To this end, it was employed primarily as a validity measure of the ODS form which was developed for the purpose of examining what older drivers "say" about the automobile and related mobility needs and problems. These data suggest that older drivers marked socially acceptable and desirable responses for what might otherwise be regarded as amoral habit or personal deficiencies. Therefore, older drivers might underreport in these content domains: drinking and driving, driving after taking drugs, other drivers, and traffic accidents and violations.

When content domains or survey items were relatively depersonalized, older drivers were more likely to respond in the anticipated direction. They recognized their driving limitations and learned to cope with them when negative personal conditions or situations were translated into inhibiting environmental factors. For example, older drivers compensated for declining performance skills (e.g. seeing, deciding, acting) by driving at less hazardous times—specifically, older drivers tend to avoid night-time and rush-hour driving.

While younger drivers (30-45) may think the environment can be conquered and molded to their requirements, older drivers may conceive the self as conforming and accommodating to the demands of the environment. Therefore, inhibiting or negative factors in the environment need to be modified to enhance an older driver's self-esteem so that he or she may continue to drive safely in traffic. These modifications can simplify tasks and thus reduce or prevent the probability of error and injury.

Older drivers appear to be a sufficiently educable and receptive audience for more tangible coping mechanisms. They indicated a willingness to learn and to apply updated driving knowledge and skills. For example, older drivers would be willing to participate in classroom driver education and in-car driver training courses as well as to try innovations in automobile design.

With at least one-third of the sample suffering arthritis, automobile design changes and apparatus for reducing the negative effects of this condition should be

considered. A sizable fraction of older drivers could profit from a better understanding of their special vulnerability to drinking and driving and driving after taking drugs. With almost one-third of the sample not being informed of the influences of prescription medications on driving an automobile, an area is suggested for physician/consumer education on this matter.

Older drivers are well enough off to afford the initial purchase of an automobile. However, they are concerned with automobile insurance claims and premiums. Professionals working in this and other fields should be trained in understanding and serving the special needs and problems of older drivers.

The majority of older drivers (78 percent) think the national maximum speed limit of 55 MPH is just right. However, in view of their higher vulnerability to injury and protracted recovery from it, it is unfortunate that a larger percentage of older drivers do not always wear their seatbelts or wear their seatbelts "most of the time." As many of them favored airbags (48 percent) as opposed them (48 percent).

Problems scores (derived from high-risk factors) were developed for specific answers on the ODS form. A direct relationship exists between the age of the driver and the seriousness of the problem score; the older the driver, the greater the problem. According to the data, problem scores seem to escalate at age 75-79. In addition, older drivers themselves reported that they would no longer wish to or would be able to drive at age 80 or thereabouts. These data suggest that drivers age 75 and over would be the appropriate age to highlight as the mobility and safety needs and problems of older drivers are addressed.

Although many older drivers said that they would no longer wish to or be able to drive at about age 80, older drivers also said that no specific age requirement should be applied for driver licensing renewal through reexamination.

Since older drivers (like other groups) are a heterogeneous group, individual problems and needs should be identified and addressed. Methods are needed for identifying incompetent drivers, without unduly penalizing others. The technique of risk self-assessment is one possible intervention tool since it would provide individuals with recommendations about risk factors of personal interest and relevance.

APPENDIX A:
Older Driver Survey (ODS) Form with Responses by Percentages (%) and Frequencies (f)

Birth Date: _____

Month Day Year

OLDER DRIVER SURVEY (ODS) FORM

The purpose of this survey is to learn more about the present and future needs and problems of licensed drivers aged 55 and over.

Survey areas include automobile design and comfort; automobile insurance; being able to drive; drinking and driving; driver licensing reexamination; driver improvement course; driver's license; driving after taking drugs; driving at night; highway design; highway signs and signals; my skill as a driver; other drivers; public transportation; seatbelts; traffic accidents and violations; and other concerns.

While your help in answering questions contained in this survey is completely voluntary, it is important that you try to answer all the questions.

All of the information which you provide will be kept anonymous. No names are necessary. When you have completed this survey, please return it to us as directed.

Thank you for your help.

QUESTIONS 1 THROUGH 12 SECTION 1 ASKS FOR SELECTED BACKGROUND INFORMATION ABOUT YOU. PLEASE READ EACH QUESTION CAREFULLY. AFTER FILLING IN THE BLANKS IN QUESTION 1, MARK AN (X) IN ONLY ONE BOX FOR EACH QUESTION EXCEPT WHERE OTHERWISE INDICATED. PLEASE ASK FOR HELP IF YOU DO NOT UNDERSTAND THE INSTRUCTIONS OR ANY QUESTION.

SECTION 1			Older Drivers		Younger Drivers		χ^2	p
			%[1][2]	n[2]	%[1][2]	n[2]		
1 In what year were you born?	19___, OR 18___ (FILL IN THE BLANKS)	30-34 (1950-54)			33 8	35		
		35-39 (1945-49)			30 8	32		
		40-45 (1939-44)			35 6	36		
		46-49 (1925-29)	3 1	14				
		50-64 (1920-24)	10 2	81				
		65-69 (1916-19)	26 7	119				
		70-74 (1910-14)	26 7	110				
		75-79 (1905-09)	16 4	73				
		80-84 (1900-04)	8 5	38				
		85-96 (1888-99)	2 1	10				
		No Response[3]	2	1	. 0	1		
2 What is your sex?	[ ] MALE		52 0	232	51 9	54		
	[ ] FEMALE		48 0	214	48 1	50		
3 What is your current marital status?	[ ] NEVER MARRIED		6 1	27	17 3	18	56 3	< 001
	[ ] MARRIED		64 3	287	61 5	64		
	[ ] WIDOWED		24 7	110	1 9	2		
	[ ] SEPARATED		4	2	1 9	2		
	[ ] DIVORCED		4 3	19	17 3	18		
	No Response		2	1				
4 How would you describe your present community setting?	[ ] COUNTRY		7 4	33	0 7	9		
	[ ] TOWN		33 2	148	26 9	28		
	[ ] CITY		58 7	262	64 4	67		
	No Response		7	3				
5 With whom do you live? (YOU MAY CHECK MORE THAN ONE)	[ ] NO ONE		31 2	139	19 2	20	5 8	< 05
	[ ] SPOUSE		63 7	284	61 5	64		
	[ ] CHILDREN		5 6	25	59 6	62	184 7	< 001
	[ ] OTHER RELATIVES		3 1	14	5 8	6		
	[ ] FRIEND		9	4	5 8	6		
6 Could you live where you do WITHOUT owning and driving an automobile?	[ ] YES		56 3	251	42 3	44	6 7	< 01
	[ ] NO		43 5	194	57 7	60		
	No Response		2	1				
7 What is the HIGHEST level of education you have completed?			%	f	%	f		
	[ ] ELEMENTARY SCHOOL		4 4	24	0	0	19 8	< 001
	[ ] JUNIOR HIGH SCHOOL		2 2	10	1 0	1		
	[ ] SOME HIGH SCHOOL		9 2	41	1 0	1		
	[ ] GRADUATED HIGH SCHOOL		28 0	125	27 9	29		
	[ ] SOME COLLEGE		24 2	108	37 5	39		
	[ ] GRADUATED 4-YEAR COLLEGE		16 9	71	14 4	15		
	[ ] ANY GRADUATE SCHOOL		14 3	64	18 3	19		
	No Response		7	3				
8 What is your current employment status?	[ ] WORKING PART-TIME FOR PAY		5 5	26	4 8	6	363 5	< 001
	[ ] WORKING FULL-TIME FOR PAY		6 6	26	91 3	95		
	[ ] NOT WORKING, BUT LOOKING FOR PAID WORK		1 3	6	1 9	2		
	[ ] RETIRED AND/OR NOT WORKING FOR PAY		86 3	384	1 9	2		
	No Response		1 3	6				
9. What is (or was) your principal occupation?	[ ] PROFESSIONAL/MANAGERIAL		37 8	168	47 1	49	37 9	< 001
	[ ] CLERICAL/OFFICE ASSISTANT		13 9	62	20 2	21		
	[ ] SKILLED TECHNICAL WORKER		9 2	41	23 1	24		
	[ ] MANUAL/INDUSTRIAL WORKER		6 2	23	1 0	1		
	[ ] SALESPERSON		7.4	33	3 8	4		
	[ ] OTHER: _____ (DESCRIBE)		22 9	102	3 8	4		
	No Response		3 8	17	1.0	1		
10 When you last worked (OR if you still do), how far did (do) you travel ROUND TRIP to your place of employment?	[ ] 0 - 10 MILES		45 7	204	35 7	36	16 2	< 01
	[ ] 11 - 20 MILES		22 0	98	24 8	25		
	[ ] 21 - 40 MILES		14 3	64	16 3	17		
	[ ] 41 - 60 MILES		6 3	28	10 6	11		
	[ ] 61 MILES OR MORE		6 1	27	16 3	17		
	No Response		6 6	26				
11. By what means did (do) you travel to work? (YOU MAY CHECK MORE THAN ONE)	[ ] BICYCLE		1 6	7	2 9	3		
	[ ] BUS		14 3	64	14 4	15		
	[ ] CAR/CAR POOL		80 7	360	89 4	93		
	[ ] TAXI		0	0	0	0		
	[ ] TRAIN OR SUBWAY		6 7	30	6 7	7		
	[ ] WALK		6 6	29	3 8	4		
	[ ] OTHER: _____ (DESCRIBE)		1 0	0	1 0	1		
12 What was the total annual income (all sources including social security) for you (and your spouse, if married) for 1983?	[ ] $ 0 - $ 3,999		2 2	10	0	0	26 0	< 001
	[ ] $ 4,000 - $ 7,999		7 6	34	1 9	2		
	[ ] $ 8,000 - $ 10,999		28 7	128	20 2	21		
	[ ] $11,000 - $ 14,999		26 2	117	18 3	19		
	[ ] $15,000 - $ 19,999		11 4	51	18 3	19		
	[ ] $20,000 - $ 39,999		13 7	61	28 8	30		
	[ ] $40,000 OR MORE		10.1	45	12 6	13		
	No Response							

QUESTIONS 13 THROUGH 39: SECTION 2 ASKS FOR INFORMATION ABOUT YOUR TRANSPORTATION CIRCUMSTANCES AND EXPERIENCES. PLEASE READ EACH QUESTION CAREFULLY. MARK AN [X] IN ONLY ONE BOX FOR EACH QUESTION EXCEPT WHERE OTHERWISE INDICATED. PLEASE ASK FOR HELP IF YOU DO NOT UNDERSTAND A QUESTION.

SECTION 2.		Older Drivers		Younger Drivers		χ^2	p
		%	f	%	f		
13 DID YOU COMPLETE A CLASSROOM DRIVER EDUCATION COURSE OR IN-CAR DRIVER TRAINING COURSE BEFORE TAKING YOUR DRIVER'S LICENSE EXAMINATION?	[ ] No	74 2	331	37 5	39	129 9	< 001
	[ ] Yes, CLASSROOM COURSE ONLY	6 1	27	11 5	12		
	[ ] Yes, IN-CAR COURSE ONLY	13 5	60	5 8	6		
	[ ] Yes, CLASSROOM AND IN-CAR COURSES	5 2	23	45 2	47		
	No Response	1 1	5				
14 DO YOU NOW HAVE AN AUTOMOBILE DRIVER'S LICENSE?	[ ] Yes	98 2	438	99 0	103		
	[ ] No	1 6	7	1 0	1		
	No Response	2	1				
15 HOW MANY YEARS HAVE YOU BEEN LICENSED TO DRIVE AN AUTOMOBILE?	[ ] NEVER LICENSED TO DRIVE (SKIP TO QUESTION 17)	1 6	7	0	0	31 1	< 001
	[ ] LESS THAN 1 YEAR	0	0	0	0		
	[ ] 1 - 4 YEARS (1-5 years)	1 3	6	0	0		
	[ ] 5 - 9 YEARS (6-10 years)	2 7	12	7 7	8		
	[ ] 10 - 14 YEARS (11-15 years)	7 4	33	26 0	27		
	[ ] 15 YEARS OR MORE (16 years or more)	85 7	382	65 4	68		
	[ ] NOT NOW LICENSED TO DRIVE (SKIP TO QUESTION 17)	1	4	1 0	1		
	No Response	2	9				
16 HOW DIFFICULT WAS IT FOR YOU TO OBTAIN OR RENEW YOUR DRIVER'S LICENSE?	[ ] VERY DIFFICULT	2	9	1 0	1		
	[ ] SOMEWHAT DIFFICULT	3 4	15	5 8	6		
	[ ] NOT VERY DIFFICULT	10 3	46	16 3	17		
	[ ] NOT AT ALL DIFFICULT	83 9	374	76 0	79		
	No Response	1 6	7	1 0	1		
17 HOW MANY AUTOMOBILES DO YOU AND/OR OTHER MEMBERS OF YOUR HOUSEHOLD OWN?	[ ] NONE (SKIP TO QUESTION 23)	1 3	6	3 8	4	28 5	< 001
	[ ] ONE	61 7	275	32 7	34		
	[ ] TWO	30 9	138	45 2	47		
	[ ] THREE OR MORE	6 1	27	17 3	18		
	No Response			1 0	1		
18 IF ANY OF THESE AUTOMOBILES IS NOT INSURED, WHY NOT? (YOU MAY CHECK MORE THAN ONE)	[ ] CAR NOT CURRENTLY USED	1 3	6	6 7	7		
	[ ] CAR NOT WORTH IT	2	1	1 9	2		
	[ ] PREMIUMS TOO HIGH	4	2	1 9	2		
	[ ] NEVER GOT AROUND TO IT	2	1	1 0	1		
	[ ] OTHER: _____ (DESCRIBE)	6 5	29	8 7	9		
19 HOW INFORMED DO YOU THINK YOU ARE ABOUT WHAT AUTOMOBILE INSURANCE COVERS AND HOW TO BUY IT?	[ ] VERY WELL INFORMED	27 8	124	28 8	30		
	[ ] FAIRLY WELL INFORMED	53 6	239	47 1	49		
	[ ] NOT VERY WELL INFORMED	16 4	73	20 2	21		
	[ ] NOT AT ALL INFORMED	1 1	5	1 0	1		
	No Response	1 1	5	2 9	3		
20. HOW MANY AUTOMOBILE INSURANCE CLAIMS HAVE YOU M'D IN THE PAST 2 YEARS?	[ ] NONE	1 3	6	65 4	68	10 0	< 01
	[ ] ONE	80 5	359	29 8	31		
	[ ] TWO	15 5	69	1 9	2		
	[ ] THREE	2 7	10	0	0		
	[ ] FOUR OR MORE	4	2	0	0		
	No Response			2 9	3		
21. HAVE YOU EVER HAD YOUR AUTOMOBILE INSURANCE CANCELLED OR HAD TO SEEK AN ALTERNATE INSURANCE CARRIER?	[ ] Yes	8 1	36	9 6	10		
	[ ] No	90 1	402	87 5	91		
	No Response	1 8	8	2 9	3		
22 WHAT FACTORS ACCOUNT FOR MOST EXPENSE OF YOUR OWNING OR DRIVING AN AUTOMOBILE? (YOU MAY CHECK MORE THAN ONE)	[ ] GASOLINE	68 4	305	59 6	62		
	[ ] INSURANCE	66 4	296	58 7	61		
	[ ] CAR PAYMENTS/PURCHASE PRICE	16 4	73	39 6	41	28 0	< 001
	[ ] MAINTENANCE AND REPAIRS	40 6	181	42 3	44		
	[ ] GARAGE STORAGE	7	3	1 0	1		
	[ ] PARKING AND/OR TOLLS	1 8	8	2 9	3		
	[ ] OTHER: _____ (DESCRIBE)	1 8	8	1 9	2		
23 CHECK THE THREE FACTORS THAT WOULD BE THE MOST IMPORTANT IN YOUR PURCHASE OF A NEW AUTOMOBILE	[ ] PURCHASE PRICE	82 1	366	85 6	89		
	[ ] GASOLINE MILEAGE	58 5	261	67 3	70		
	[ ] INJURY PROTECTION SYSTEM	33 6	132	32 7	34		
	[ ] ESTIMATED REPAIR COSTS	20 9	93	22 1	23		
	[ ] INSURANCE COSTS	23 6	101	18 3	19		
	[ ] STYLING/DESIGN	27 1	121	30 8	32		
	[ ] PREFERENCE FOR DOMESTIC	20 2	128	15 4	16	7 9	< 01
	[ ] PREFERENCE FOR FOREIGN	6 2	23	9 6	10		
	[ ] OTHER _____ (DESCRIBE)	3 4	15	3 8	4		
24 WHETHER OR NOT YOU NOW OWN AN AUTOMOBILE, DO YOU HAVE EASY ACCESS TO ONE?	[ ] Yes	89 7	400	94 2	98		
	[ ] No	6 3	28	5 8	6		
	No Response	3 8	17				
25 WHETHER YOU ARE A DRIVER OR A PASSENGER, CHECK THE THREE MAIN PURPOSES FOR WHICH YOU USE AN AUTOMOBILE	[ ] NEVER USE AN AUTOMOBILE (SKIP TO QUESTION 35)	9	4	1 9	2		
	[ ] GROCERY AND OTHER SHOPPING	88 8	396	79 8	83	7 1	< 01
	[ ] GETTING TO AND FROM WORK	9 9	44	85 6	89	261 9	< 001
	[ ] HEALTH CARE SERVICES	28 0	125	7 7	8	19 3	< 001
	[ ] GOING TO CHURCH	41 3	184	15 4	16	24 8	< 001
	[ ] GETTING TO APPOINTMENTS	35 0	156	23 1	24	5 6	< 05
	[ ] ATTENDING MEETINGS	28 3	126	11 5	12	12 8	< 001
	[ ] VISITING FRIENDS/RELATIVES	50 9	227	52 9	55		
	[ ] VOLUNTEER ACTIVITY	23 1	103	3 8	4	20 2	< 001
	[ ] OTHER: _____ (DESCRIBE)	8 7	39	12 5	13		
26. HOW OFTEN DO YOU DRIVE AN AUTOMOBILE?	[ ] EVERY DAY	65 9	294	81 7	85	9 8	< 05
	[ ] EVERY OTHER DAY	20 4	91	9 6	10		
	[ ] ONCE OR TWICE A WEEK	8 1	36	6 8	6		
	[ ] ONCE OR TWICE A MONTH	4	2	1 0	1		
	[ ] RARELY	1 6	7	0	0		
	[ ] NOT AT ALL (SKIP TO QUESTION 34)	1 8	8	1 0	1		
	No Response	1 8	8	1 0	1		

27	How many miles have you driven in the past year?	[ ] Fewer than 1,000 miles	7 2	32	3 8	4	71 7	< 001	
		[ ] 1,000 - 5,999 miles	27 6	123	10 6	11			
		[ ] 6,000 - 9,999 miles	33 3	151	10 3	18			
		[ ] 10,000 -14,999 miles	18 8	82	26 8	18			
		[ ] 15,000 -19,999 miles	5 6	25	17 3	10			
		[ ] 20,000 miles or more	4 0	18	21 2	22			
		No Response	3 4	15	2 0	2			
28	When do you do most of your driving? (You may check more than one)	[ ] 8:01AM - 10:00AM	35 2	157	57 7	60	16 8	< 001	
		[ ] 10:01AM - 12:00NOON	62 3	278	21 3	22	62 7	< 001	
		[ ] 12:01PM - 2:00PM	39 7	177	17 3	18	19 8	< 001	
		[ ] 2:01PM - 4:00PM	55 6	248	22 1	23	50 0	< 001	
		[ ] 4:01PM - 6:00PM	31 4	140	48 1	50	9 6	< 01	
		[ ] 6:01PM - 8:00PM	25 1	112	35 6	37	4 2	< 05	
		[ ] 8:01PM - 12:00MIDNIGHT	16 4	73	24 0	25			
		[ ] 12:01AM - 8:00AM	1 8	8	24 0	25	72 6	< 001	
29	How much of your driving is done at night?	[ ] None	2 9	13	0	0	59 0	< 001	
		[ ] 1 - 15 PERCENT	11 0	49	39 4	41			
		[ ] 16 - 30 PERCENT	60 1	268	30 8	32			
		[ ] 31 - 50 PERCENT	19 5	87	17 3	18			
		[ ] 51 - 75 PERCENT	5 8	26	7 7	8			
		[ ] More than 75 PERCENT	7	3	2 8	3			
		No Response			1 9	2			
30	When your car is not used for long (more than one day) trips, why not?	[ ] Uncomfortable	4 9	22	6 7	7	15 0	< 01	
		[ ] Too tiring	18 2	81	10 6	11			
		[ ] Too expensive	13 0	58	24 0	25			
		[ ] Car may break down	3 8	17	10 6	11			
		[ ] Other. _____ (describe)	34 3	153	33 7	35			
		No Response	25 8	115	14 4	15			
31	How long were you or have you been the principal driver of the automobile in your family?	[ ] Never	9 2	41	8 7	9	71 6	< 001	
		[ ] Less than 1 year	1 1	5	1 0	1			
		[ ] 1 - 5 years	4 7	21	9 6	10			
		[ ] 6 - 10 years	3 6	16	22 1	23			
		[ ] 11 - 20 years (11-15 years)	8 1	36	30 2	31			
		[ ] 21 years or more (16 years or more)	69 1	311	35 8	37			
		No Response	3 6	16	2 9	3			
32	Who usually rides with you when you drive?	[ ] Spouse	54 9	245	27 9	29	83 3	< 001	
		[ ] Children	2 5	11	22 1	23			
		[ ] Other relatives	5 8	26	1 9	2			
		[ ] Friend	16 6	74	9 6	10			
		[ ] Other _____ (describe)	1 1	5	1 9	2			
		[ ] No one	16 4	73	34 6	36			
		No Response	2 7	12	1 9	2			
33	How do you feel about having passengers when you drive?	[ ] Strongly favorable	13 9	62	10 6	11			
		[ ] Don't mind	79 6	355	85 6	89			
		[ ] Strongly unfavorable	3 4	15	1 9	2			
		No Response	3 1	14	1 9	2			
34	Who usually drives for you if you do not drive yourself?	[ ] Spouse	43 5	194	51 0	53	10 8	< 05	
		[ ] Children	10 3	46	1 0	1			
		[ ] Other relatives	5 6	25	5 8	6			
		[ ] Friend	14 8	66	20 2	21			
		[ ] Other. _____ (describe)	2 2	10	1 9	2			
		[ ] No one	19 1	85	19 2	20			
		No Response	4 5	20	1 0	1			
35	Is public transportation (bus, train, subway, taxi) available?	[ ] Yes	86 1	384	83 7	87			
		[ ] No (SKIP to question 38)	12 3	55	16 3	17			
		No Response	1 6	7					
36	Is the public transportation convenient?	[ ] Yes	56 5	252	41 3	43	8 7	< 01	
		[ ] No	31 8	142	46 2	48			
		No Response	11 7	52	12 5	13			
37	How often do you use public transportation?	[ ] Every day	1 1	5	9 6	10	38 0	< 001	
		[ ] Every other day	7	3	4 8	5			
		[ ] Once or twice a week	2 7	12	1 9	2			
		[ ] Once or twice a month	8 7	39	1 9	2			
		[ ] Rarely	42 4	189	37 5	39			
		[ ] Not at all	34 5	154	34 6	36			
		No Response	9 9	44	9 6	10			
38	In which two ways do you prefer to get around?	[ ] Drive myself	91 5	408	96 2	100			
		[ ] Have someone drive me	31 2	139	41 3	43			
		[ ] Use public transportation	12 3	55	9 6	10			
		[ ] Bicycle	4 3	19	6 7	7			
		[ ] Walk	22 9	102	21 2	22			
		[ ] Other: _____ (describe)	1 8	8	2 7	3			
39	Five years from now, how often do you think you will have a need for an automobile as driver or passenger?	[ ] Every day	48 9	218	91 3	95	59 6	< 001	
		[ ] Every other day	22 6	101	4 8	5			
		[ ] Once or twice a week	19 6	87	2 9	3			
		[ ] Once or twice a month	7	3	0	0			
		[ ] Rarely	3 8	17	1 0	1			
		[ ] Not at all	2 7	12	0	0			
		No Response	1 8	8					

Questions 40 through 81 Section 3 asks for information about some of the conditions and skills necessary for safe driving. Please read each question carefully. Mark an (X) in only one box for each question, except where otherwise indicated. Please ask for help if you do not understand a question.

			Older Drivers		Younger Drivers		χ^2	p
Section 3.			%	f	%	f		
40.	How would you describe your eyesight (with glasses or contact lenses if normally worn)?	[ ] Excellent	36 8	164	59 6	62	17 7	< 001
		[ ] Good	66 1	294	37 5	39		
		[ ] Fair	5 6	25	2 9	3		
		[ ] Poor	4	2	0	0		
		No Response	1 1	6				
41.	Does your driver license require that you wear glasses or contact lenses?	[ ] Yes	60 8	271	44 2	46	10 3	< 01
		[ ] No	38 1	170	66 8	68		
		No Response	1 1	5				

			Older Drivers		Younger Drivers		χ^2	p
			%	f	%	f		
42	Do you wear glasses or contact lenses for seeing in the distance?	[_] Yes	68 2	304	52 7	55	9 8	< 01
		[_] No	30 5	136	47 1	49		
		No Response	1 3	6				
43	Do you wear glasses or contact lenses for reading?	[_] Yes	93 3	416	51 0	53	129 4	< 001
		[_] No	5 8	26	49 0	51		
		No Response		9	4			
44	Do you have any of these visual problems?	[_] Cataract	9 9	44	1 0	1	8 8	< 01
		[_] Glaucoma	4 7	21	1 0	1		
		[_] Color blindness	1 6	7	1 0	1		
		[_] Night blindness	4 3	19	4 8	5		
		[_] Tunnel vision	1 3	6	0	0		
	(you may check more than one)	[_] None of the above	70 9	316	78 5	82	4 3	< 05
		[_] Other _____ (describe)	7 2	32	6 7	7		
45	Do you have difficulty reading traffic signs or signals before you are too close for them to do any good?	[_] Frequently	2 7	12	1 0	1	16 8	< 001
		[_] Sometimes	24 4	109	11 5	12		
		[_] Seldom	32 5	145	26 9	28		
		[_] Never	39 5	176	60 6	63		
		No Response	9	4				
46	For traffic signs (highway/street) do you have any difficulty with their	[_] Placement	41 7	186	33 7	35		
		[_] Size	16 8	75	14 4	15		
		[_] Shape	9	4	1 9	2		
		[_] Colors	2 5	11	1 9	2		
	(you may check more than one)	[_] Clarity of lettering	16 4	73	13 5	14		
		[_] Message	13 0	58	15 4	16		
		[_] No difficulty	48 4	216	55 3	58		
47	On which roads do you have great difficulty with traffic signs?	[_] Interstate highways(freeways)	13 9	62	10 6	11		
		[_] Freeways through cities	31 2	139	23 1	24		
		[_] 2-lane rural roads	10 1	45	10 5	11		
		[_] City streets	35 7	159	23 1	24	6 2	< 05
	(you may check more than one)	[_] None of the above	34 3	153	50 0	52	8 2	< 01
48	Do you have difficulty seeing at night when you drive?	[_] Frequently	5 6	25	3 8	4		
		[_] Sometimes	34 5	154	27 9	29		
		[_] Seldom	33 0	147	36 5	38		
		[_] Never	23 8	106	31 7	33		
		No Response	3 1	14				
49.	Does oncoming headlight glare at night bother you more or less than two years ago?	[_] More	20 4	91	15 4	16		
		[_] About the same	74	332	79 8	83		
		[_] Less	2 7	12	3 8	4		
		No Response	2 5	11	1 0	1		
50	How valuable do you consider clear center line road marking?	[_] Very valuable	95 7	427	89 4	93	14 0	< 001
		[_] Somewhat valuable	2 5	11	10 6	11		
		[_] Not very valuable	0	0	0	0		
		[_] Not at all valuable	2	1	0	0		
		No Response	1 6	7				
51	Do you wear a hearing aid?	[_] Yes	8 3	37	9	0	9 3	< 01
		[_] No	91 0	406	99 0	103		
		No Response	7	3	1 0	1		
52	How would you describe your hearing (with hearing aid if normally worn)?	[_] Excellent	32 3	144	68 3	71	35 9	< 001
		[_] Good	43 7	195	25 0	26		
		[_] Fair	9 0	40	2 9	3		
		[_] Poor	4	2	0	0		
		No Response	14 6	65	3 8	4		
53	What alcoholic beverages do you usually drink?	[_] Beer	22 9	102	46 2	48	22 9	< 001
		[_] Wine	32 5	145	51 9	54	13 0	< 01
		[_] Hard liquor	26 7	119	49 0	51	18 9	< 001
	(you may check more than one)	[_] None (SKIP to question 59)	41 5	185	17 3	18	22 2	< 001
54	How often do you drink alcoholic beverages?	[_] More than once daily	2	1	1 9	1	31 3	< 001
		[_] Every day	16 4	73	7 7	8		
		[_] Every other day	4 9	22	4 8	5		
		[_] Once or twice a week	18 2	81	40 4	42		
		[_] Once or twice a month	6 7	30	18 3	19		
		[_] Rarely	22 9	102	13 5	14		
		No Response	30 7	137	14 4	15		
55	When you drink, how much do you usually have?	[_] One drink	39 2	175	22 1	23	36 5	< 001
		[_] Two drinks	21 3	95	40 4	42		
		[_] Three drinks	4 0	18	16 3	17		
		[_] Four drinks or more	1 8	8	6 7	7		
		No Response	33 6	150	14 4	15		
56	Do you drive soon after you have been drinking?	[_] Never (SKIP to question 59)	36 1	161	18 3	19	38 8	< 001
		[_] Seldom	23 3	104	33 3	35		
		[_] Sometimes	8 3	37	30 8	32		
		[_] Frequently	7	3	1	2		
		No Response	31 6	141	15 4	16		
57.	How soon after drinking do you usually drive?	[_] Less than 1/2 hour	2 0	9	6 7	7	15 5	< 01
		[_] 1/2 to 2 hours	21 2	94	46 2	48		
		[_] 2 to 4 hours	12 6	56	16 3	17		
		[_] 4 to 8 hours	3 6	16	1 0	1		
		[_] After 8 hours	5 4	24	1 0	1		
		No Response	55 4	247	28 8	30		
58.	In which way do you notice the most difference in the way you drive after drinking?	[_] No difference	25 6	114	26 9	28	23 1	< 001
		[_] Make more mistakes	9	4	3 8	4		
		[_] Drive slower	8.3	37	26 0	27		
		[_] Do not pass other cars as often	9	4	3 8	4		
		[_] Avoid driving at night	6 6	29	1 0	1		
		[_] Others: _____ (describe)	2 9	13	10 6	11		
		No Response	55.8	249	27 9	29		
59.	Do you have either arthritis or rheumatism or both?	[_] Neither	61 0	272	88 5	92	30.8	< 001
		[_] Have arthritis	36 2	161	8 7	9		
		[_] Have rheumatism	1 3	6	1 0	1		
		[_] Both	9	4	0	0		
		No Response	1.6	7	1.9	2		

60	CHECK THE FOLLOWING JOINTS WHICH YOU HAVE HAD SURGICALLY REPAIRED OR REPLACED (YOU MAY CHECK MORE THAN ONE)	[ ] HOME	80 7	360	72 1	75		
		[ ] HIP	2 5	11	1 9	2		
		[ ] KNEE	3 4	15	5 8	6		
		[ ] ANKLE	9	4	1 8	2		
		[ ] SHOULDER	4	2	2 9	3		
		[ ] ELBOW	1 1	5	1 0	1		
		[ ] WRIST	1 3	6	1 9	2		
		[ ] FINGERS	2 5	11	1 9	2		
		[ ] TOES	7	3	0	0		
61	HOW OFTEN DOES A PAINFUL OR STIFF JOINT INTERFERE WITH YOUR ABILITY TO DRIVE?	[ ] FREQUENTLY	2	1	0	0		
		[ ] SOMETIMES	2 5	11	4 8	5		
		[ ] SELDOM	11 0	49	9 6	10		
		[ ] NEVER	83 4	372	83 7	87		
		No Response	2 9	13	1 9	2		
62	DO YOU REQUIRE THAT A CAR BE EQUIPPED WITH AN AUTOMATIC TRANSMISSION BECAUSE OF WEAK, PAINFUL, OR STIFF LOWER EXTREMITY JOINTS?	[ ] YES	7 2	32	1 0	1	5 9	< 05
		[ ] NO	90 8	405	78 1	102		
		No Response	2 0	9	1 0	1		
63	DO YOU REQUIRE THAT A CAR BE EQUIPPED WITH POWER STEERING BECAUSE OF WEAK, PAINFUL OR STIFF UPPER EXTREMITY JOINTS?	[ ] YES	9 4	42	1 0	1	8 5	< 01
		[ ] NO	88 1	393	98 1	102		
		No Response	2 0	9	1 0	1		
64	HOW DIFFICULT IS IT FOR YOU TO GET INTO AND OUT OF YOUR OWN CAR OR CARS OF PEOPLE YOU RIDE WITH?	[ ] VERY DIFFICULT	7	3	0	0	19 9	< 001
		[ ] SOMEWHAT DIFFICULT	13 9	62	4 8	5		
		[ ] NOT VERY DIFFICULT	28 0	125	14 4	15		
		[ ] NOT AT ALL DIFFICULT	55 8	249	78 8	82		
		No Response	1 6	7	1 9	2		
65.	DO YOU HAVE HEART DISEASE?	[ ] YES	13 4	51	1 9	2	13 5	< 01
		[ ] NO	85 2	380	91 3	95		
		[ ] I DON'T KNOW	1 8	8	5 8	6		
		No Response	1 6	7	1 0	1		
66	DO YOU HAVE HIGH BLOOD PRESSURE?	[ ] YES	24 9	111	7 7	8	15 5	< 001
		[ ] NO	71 7	320	91 3	95		
		[ ] I DON'T KNOW	2 0	9	0	0		
		No Response	1 3	6	1 0	1		
67	HAVE YOU EVER BLACKED OUT FROM ANY OF YOUR MEDICAL PROBLEMS WHILE DRIVING?	[ ] YES	7	3	1 0	1		
		[ ] NO	97 8	436	98 1	102		
		No Response	1 6	7	1 0	1		
68	DO YOU TAKE MEDICATION FOR HEART DISEASE OR INCREASED BLOOD PRESSURE?	[ ] I DON'T HAVE EITHER CONDITION	53 1	237	87 5	91	41 9	< 001
		[ ] YES, FOR HEART DISEASE	10	47	1 8	2		
		[ ] YES, FOR INCREASED BLOOD PRESSURE	2	109	4 0	5		
		[ ] NO, I SHOULD BUT I DON'T	½	40	1 8	4		
		No Response	2	13	1 9	2		
69	DOES YOUR DOCTOR OR PHARMACIST TELL YOU WHEN PRESCRIBED DRUGS MAY AFFECT YOUR DRIVING?	[ ] YES	37 7	168	60 6	63	23 6	< 001
		[ ] NO	31 6	141	10 6	11		
		[ ] I DO NOT TAKE PRESCRIBED DRUGS (SKIP TO QUESTION 71)	21 5	96	27 9	29		
		No Response	9 2	41	1 0	1		
70	DO ANY OF YOUR PRESCRIBED DRUGS MAKE IT MORE DIFFICULT FOR YOU TO DRIVE?	[ ] YES	1 6	7	9 6	10	18 2	< 001
		[ ] NO	69 7	311	62 5	65		
		No Response	28 7	128	27 9	29		
71	HOW OFTEN DO YOU WEAR YOUR SEATBELT WHEN YOU ARE A PASSENGER IN AN AUTOMOBILE?	[ ] ALWAYS (SKIP TO QUESTION 73)	26 5	118	29 8	31		
		[ ] MOST OF THE TIME	23 5	105	15 4	16		
		[ ] SOMETIMES	23 1	103	18 3	19		
		[ ] SELDOM	10 8	48	16 3	17		
		[ ] NEVER	14 6	66	17 3	18		
		No Response	1 3	6	2 9	3		
72	WHEN YOU DON'T WEAR YOUR SEATBELT AS A PASSENGER, WHY NOT? (YOU MAY CHECK MORE THAN ONE)	[ ] DRIVER DOESN'T	6 5	29	5 8	6		
		[ ] I FORGET ABOUT IT	29 6	132	35 6	37		
		[ ] TOO HARD TO PUT ON	11 2	50	5 8	6		
		[ ] INCONVENIENT	20 6	92	10 3	19		
		[ ] UNCOMFORTABLE	21 7	97	23 1	24		
		[ ] DON'T HAVE ONE	3 4	15	7 7	8	4 7	< 05
		[ ] DON'T NEED ONE	1 8	8	1 0	1		
		[ ] OTHER: _____ (DESCRIBE)	6 5	29	7 7	8		
73	WHAT DO YOU THINK ABOUT THE NATIONAL MAXIMUM SPEED LIMIT OF 55 MPH?	[ ] IT IS JUST RIGHT	78 0	348	53 8	56	34 8	< 001
		[ ] IT SHOULD BE INCREASED	10 8	44	46 2	48		
		[ ] IT SHOULD BE DECREASED	2 0	9	0	0		
		No Response	1 1	5				
74	DO YOU THINK IT IS SAFE TO DRIVE MAX BELOW (FOR EXAMPLE, 40MPH IN A 55MPH ZONE) THE POSTED SPEED LIMIT?	[ ] YES	13 0	58	6 7	7		
		[ ] NO	85 7	382	93 3	97		
		No Response	1 3	6				
75	WHEN DID YOU LAST READ THE DRIVER'S MANUAL FOR YOUR STATE?	[ ] NEVER HAVE READ IT	9 0	40	1 9	2	13 4	< 05
		[ ] IN THE LAST 6 MONTHS	13 9	62	10 6	11		
		[ ] IN THE LAST YEAR	15 5	87	15 4	16		
		[ ] IN THE LAST 2 YEARS	16 4	73	17 3	18		
		[ ] IN THE LAST 3 YEARS	10 3	46	10 6	11		
		[ ] 4 YEARS OR MORE AGO	28 5	127	44 2	46		
		No Response	2 5	11				
76	HOW WELL-INFORMED ARE YOU ABOUT THE CURRENT RULES AND REGULATIONS IN YOUR STATE?	[ ] VERY WELL INFORMED	27 1	121	27 9	29		
		[ ] FAIRLY WELL INFORMED	62 1	277	63 5	66		
		[ ] NOT VERY WELL INFORMED	9 0	40	8 7	9		
		[ ] NOT AT ALL INFORMED	1 1	5	0	0		
		No Response	7	3				
77	WHEN DID YOU LAST ATTEND A DRIVER EDUCATION, TRAINING OR RETRAINING COURSE?	[ ] NEVER	42 4	189	30 8	32	57 0	< 001
		[ ] LESS THAN 6 MONTHS AGO	13 2	59	3 8	4		
		[ ] 6 - 11 MONTHS AGO	10 8	48	5 8	6		
		[ ] 1 - 2 YEARS AGO	11 9	53	6 7	8		
		[ ] 3 - 4 YEARS AGO	4 9	22	1 9	2		
		[ ] MORE THAN 5 YEARS AGO	15 5	69	49 0	51		
		No Response	1 3	6				
78.	WOULD YOU BE WILLING TO TAKE A DRIVER EDUCATION, TRAINING OR RETRAINING COURSE?	[ ] YES	80 0	357	69 2	72	8 2	< 01
		[ ] NO	17 4	78	29 8	31		
		No Response	2 6	11	1 0	1		

QUESTIONS 79 THROUGH 81 PLEASE INDICATE HOW STRONGLY YOU AGREE OR DISAGREE WITH THE FOLLOWING QUESTIONS BY MARKING AN [X] IN ONE BOX FOR EACH QUESTION

			Older Drivers		Younger Drivers		χ^2	p
			%	f	%	f		
79	THE REACTION TIME OF MOST DRIVERS AGED AT LEAST 55 TENDS TO BE SLOWER THAN THE REACTION TIME OF DRIVERS BELOW AGE 40	STRONGLY AGREE	34 5	154	41 3	43		
		SLIGHTLY AGREE	34 8	155	36 5	38		
		NEUTRAL	16 6	74	11 5	12		
		SLIGHTLY DISAGREE	7 4	33	8 7	9		
		STRONGLY DISAGREE	5 8	26	1 9	2		
		NO RESPONSE		2		1		
80	THE JUDGMENTAL ABILITIES OF DRIVERS AGED AT LEAST 55 TEND TO BE POORER THAN THOSE OF DRIVERS BELOW AGE 40	STRONGLY AGREE	11 0	49	19 2	20	13 3	< 01
		SLIGHTLY AGREE	27 4	122	25 0	26		
		NEUTRAL	22 0	98	25 0	26		
		SLIGHTLY DISAGREE	17 5	78	22 1	23		
		STRONGLY DISAGREE	21 5	96	8 7	9		
		NO RESPONSE		7		3		
81	IT IS ALMOST IMPOSSIBLE FOR DRIVERS AGED 55 AND OVER TO LEARN AND USE ANYTHING NEW TO IMPROVE TRAFFIC SAFETY	STRONGLY AGREE	4 9	22	3 8	4		
		SLIGHTLY AGREE	6 1	27	9 6	10		
		NEUTRAL	12 3	55	12 5	13		
		SLIGHTLY DISAGREE	13 0	58	19 2	20		
		STRONGLY DISAGREE	63 5	283	54 8	57		
		NO RESPONSE		2		1		

QUESTIONS 82 THROUGH 128 SECTION 4 ASKS FOR INFORMATION ABOUT SOME OF THE ACTIONS AND CONDITIONS NECESSARY FOR SAFE DRIVING. PLEASE READ EACH QUESTION CAREFULLY. MARK AN [X] IN ONLY ONE BOX FOR EACH QUESTION, EXCEPT WHERE OTHERWISE INDICATED. PLEASE ASK FOR HELP IF YOU DO NOT UNDERSTAND A QUESTION.

SECTION 4.

			Older Drivers		Younger Drivers		χ^2	p
			%	f	%	f		
82.	IN COMPARISON TO YOURSELF TWO YEARS AGO, HOW IS YOUR ABILITY TO SEE WHEN YOU ARE IN TRAFFIC?	BETTER	3 6	16	6 7	7		
		ABOUT THE SAME	90 8	405	88 5	92		
		WORSE	4 9	22	4 8	5		
		No Response		7		3		
83.	IN COMPARISON TO YOURSELF TWO YEARS AGO, HOW IS YOUR ABILITY TO HEAR WHEN YOU ARE IN TRAFFIC?	BETTER	2 2	10	2 9	3		
		ABOUT THE SAME	93 3	416	96 2	100		
		WORSE	4 0	18	1 0	1		
		No Response		4		2		
84	HOW OFTEN DO YOU USE YOUR INSIDE REAR VIEW MIRROR?	FREQUENTLY	95 5	426	93 3	97		
		SOMETIMES	2 7	12	3 8	4		
		SELDOM		2	1 0	1		
		NEVER		2	1 0	1		
		No Response	1 3	6	1 0	1		
85	HOW OFTEN DO YOU USE YOUR DRIVER SIDE VIEW MIRROR?	FREQUENTLY	88 1	393	85 6	89		
		SOMETIMES	7	32	10 6	11		
		SELDOM	2 9	13	2 9	3		
		NEVER	9	4	1 0	1		
		No Response	9	4				
86	HOW OFTEN DO YOU USE YOUR PASSENGER SIDE VIEW MIRROR?	DO NOT HAVE ONE	36 1	161	36 5	38		
		FREQUENTLY	27 1	121	30 8	32		
		SOMETIMES	16 4	73	9 6	10		
		SELDOM	9 4	42	14 4	15		
		NEVER	7 6	34	8 7	9		
		No Response	3 4	15				
87	DO YOU EXPERIENCE ANY DISCOMFORT OR PAIN WHEN SITTING IN THE DRIVER'S SEAT FOR A LONG PERIOD OF TIME?	YES	28 5	127	41 3	43	6 8	< 01
		NO	70 2	313	56 7	59		
		No Response	1 3	6	1 9	2		
88	HOW DIFFICULT IS IT FOR YOU TO TURN YOUR HEAD TO LOOK BACK OVER YOUR SHOULDER WHEN DRIVING OR BACKING UP?	VERY DIFFICULT	1 6	7	0	0	18 9	< 001
		SOMEWHAT DIFFICULT	21 3	95	4 8	5		
		NOT VERY DIFFICULT	29 1	130	31 7	33		
		NOT AT ALL DIFFICULT	46 6	208	63 5	66		
		No Response	1 3	6				
89	DO YOU HAVE ANY TROUBLE SEEING/READING THE GAUGES ON YOUR INSTRUMENT PANEL?	YES	9 4	42	2 9	3	4 9	< 05
		NO	89 5	399	97 1	101		
		No Response	1 1	5				
90.	DO YOU HAVE ANY TROUBLE REACHING, USING OR WORKING ANY OF THESE CAR PARTS? (YOU MAY CHECK MORE THAN ONE)	SEATBELT	21 7	97	9 6	10	7 9	< 01
		ACCELERATOR	1 1	5	0	0		
		BRAKES	0	0	0	0		
		HORN	9	4	0	0		
		HEADLIGHT SWITCH	2 7	12	3 8	4		
		HEATER/AIR CONDITIONER	3 6	16	1 0	1		
		RADIO	7 6	34	1 9	2	4 5	< 05
		GEAR SHIFT	4 0	18	3 8	4		
		WINDSHIELD WASHER/WIPER	1 3	6	1 0	1		
		TURN SIGNAL LEVER	2 9	13	1 9	2		
		4-WAY FLASHER	1 1	5	0	0		
		OTHER: _____ (DESCRIBE)	7 4	33	5 8	6		
			11 4	51	12 5	13		
91.	HOW OFTEN DO YOU WEAR YOUR SEATBELT WHEN YOU ARE THE DRIVER OF AN AUTOMOBILE?	ALWAYS (SKIP TO QUESTION 93)	32 5	145	32 5	33		
		MOST OF THE TIME	17 5	78	15 8	16		
		SOMETIMES	21 3	95	17 3	18		
		SELDOM	12 3	55	9 6	10		
		NEVER	14 3	64	19 2	20		
		No Response	2 0	9	1 0	1		
92.	WHEN YOU DON'T WEAR YOUR SEATBELT AS THE DRIVER, WHY NOT? (YOU MAY CHECK MORE THAN ONE)	PASSENGER(S) DOESN'T	7	3	1 0	1		
		I FORGET ABOUT IT	30 0	134	34 6	36		
		TOO HARD TO PUT ON	10 1	45	3 8	4		
		INCONVENIENT	19 1	85	16 3	17		
		UNCOMFORTABLE	21 1	94	20 2	21		
		DON'T HAVE THEM	1 8	8	1 9	2		
		DON'T NEED THEM	2 0	9	1 9	2		
		OTHER: _____ (DESCRIBE)	4 9	22	7 7	8		

93. Would you be in favor of a law requiring all drivers and passengers to wear seatbelts?	[ ] Yes	65 2	291	57 7	60		
	[ ] No	32 7	146	42 3	44		
	No Response	2 0	9				
94. If affordable, would you like to have air bags or passive restraints built into your automobile to protect you in an accident?	[ ] Yes	47 5	212	75 0	78	21 1	< 001
	[ ] No	47 5	212	25 0	26		
	No Response	4 9	22				
95. When you made the decision to buy a new car, did you check on the safety features and safety equipment available for the various competing makes and models?	[ ] Never bought a new car	11 7	52	25 9	26	12 6	< 01
	[ ] Yes	46 9	209	36 5	38		
	[ ] No	40 4	180	38 5	40		
	No Response	1 1	5				
96. Which of the following features or items do you have in your car? (You may check more than one)	[ ] Padding on the instrument panel	62 3	278	71 2	74		
	[ ] Padded sun visors	57 4	256	76 9	80	13 5	< 001
	[ ] Outside mirror on the right s'de, as well as on the left	52 2	233	55 8	58		
	[ ] Head restraints for the driver and right front passenger	68 8	307	74 0	77		
	[ ] Seatbelts for every seating position	87 2	389	88 4	93		
	[ ] Rear window defroster or defogger	52 2	233	49 0	51		
	[ ] Emergency flasher system	85 7	382	96 2	100	9 4	< 01
	[ ] Power steering	83 9	374	80 8	84		
	[ ] Power door locks	23 1	103	18 3	19		
	[ ] Steering wheel with tilt adjustment	34 8	155	26 9	28		
	[ ] Power braking	76 0	348	78 8	82		
97 Please indicate whether your driving ability, under each condition below, is better, about the same, or worse than 5 years ago. Mark an [X] in the appropriate box							
A. Night driving	[ ] Better	1 1	5	3 8	4	5 8	< 05
	[ ] Same	66 1	295	78 8	82		
	[ ] Worse	25 1	112	15 4	16		
	[ ] Does not apply	7 6	34	0	0		
B Headlight glare	[ ] Better	9	4	3 8	4		
	[ ] Same	67 3	300	70 2	73		
	[ ] Worse	25 3	113	24 0	25		
	[ ] Does not apply	6 5	29	0	0		
C Winter driving	[ ] Better	1 1	5	22 1	23	79 8	< 001
	[ ] Same	69 3	309	55 8	58		
	[ ] Worse	9 9	44	2 9	3		
	[ ] Does not apply	19 7	88	16 3	17		
D Rain and fog	[ ] Better	1 1	5	17 3	18	60 6	< 001
	[ ] Same	74 0	330	74 0	77		
	[ ] Worse	19 1	85	5 8	6		
	[ ] Does not apply	5 9	26	1 0	1		
E Snow, sleet, or slush	[ ] Better	1 6	7	19 2	20	61 6	< 001
	[ ] Same	56 7	25	50 0	52		
	[ ] Worse	14 3	64	3 8	4		
	[ ] Does not apply	27 4	122	23 1	24		
F Interstate (freeway) driving	[ ] Better	4 3	19	24 0	25	43 4	< 001
	[ ] Same	73 8	329	70 2	73		
	[ ] Worse	9 0	40	1 9	2		
	[ ] Does not apply	13 1	58	1 0	1		
G. City streets	[ ] Better	2 7	12	20 2	21	43 9	< 001
	[ ] Same	85 2	380	72 1	75		
	[ ] Worse	5 8	26	4 8	5		
	[ ] Does not apply	6 3	28	1 0	1		
H Rush hour driving	[ ] Better	1 3	6	27 9	29	93 4	< 001
	[ ] Same	66 1	295	62 3	65		
	[ ] Worse	19 1	85	6 7	7		
	[ ] Does not apply	13 5	60	1 0	1		
I. When tired or upset	[ ] Better	1 3	6	6 7	7	14 5	< 001
	[ ] Same	57 0	254	75 0	78		
	[ ] Worse	24 4	109	15 4	16		
	[ ] Does not apply	17 3	77	1 0	1		
J. After drinking	[ ] Better	0	0	9 6	10	19 4	< 001
	[ ] Same	28 3	126	59 6	62		
	[ ] Worse	3 6	16	3 8	6		
	[ ] Does not apply	68 1	304	21 2	22		
K. After medication	[ ] Better	2	1	2 9	3		
	[ ] Same	35.9	160	62 9	65		
	[ ] Worse	1 1	5	2 9	3		
	[ ] Does not apply	62 7	280	34.6	36		
L. Holiday/Vacation driving	[ ] Better	2 7	12	14 4	15	20 3	< 001
	[ ] Same	75 2	322	75 0	78		
	[ ] Worse	5 2	23	3 8	4		
	[ ] Does not apply	20 0	89	4 8	5		
M. Going up/down steep hills	[ ] Better	2 9	13	16 3	17	28 2	< 001
	[ ] Same	78.9	352	76 9	80		
	[ ] Worse	6 6	25	1 9	2		
	[ ] Does not apply	12 6	56	2 9	3		

		Older Drivers		Younger Drivers		χ^2	p
		%	f	%	f		
0	LONG-DISTANCE DRIVING						
	BETTER	3 1	14	20 2	21	40 0	< 001
	SAME	60 3	269	69 2	72		
	WORSE	17 9	80	6 7	7		
	DOES NOT APPLY	18 7	83	1 9	2		
98.	HOW OFTEN DO YOU "NOD OFF" WHEN YOU ARE DRIVING AN AUTOMOBILE?						
	FREQUENTLY	1 1	6	1 0	1		
	SOMETIMES	4 7	21	3 8	4		
	SELDOM	18 4	82	25 0	26		
	NEVER	74 4	332	68 3	71		
	No Response	1 3	6	1 9	2		
99.	IN COMPARISON TO YOURSELF TWO YEARS AGO, HAVE YOU NOTICED THAT YOUR JUDGMENT OUT ON THE ROAD (E.G. WHEN TO PASS OR STAY IN LANE) IS:						
	BETTER	6 3	28	22 1	23	26 0	< 001
	ABOUT THE SAME	89 5	399	75 0	78		
	WORSE	2 5	11	1 0	1		
	No Response	1 8	8	1 9	2		
100.	DO YOU HAVE DIFFICULTY ENTERING OR LEAVING HIGH SPEED INTERSTATE HIGHWAYS (FREEWAYS)?						
	ALWAYS	1 8	8	1 0	1	22 0	< 001
	MOST OF THE TIME	3 6	16	1 0	1		
	SOMETIMES	26 7	119	12 5	13		
	SELDOM	37 0	165	34 6	36		
	NEVER	27 1	121	49 0	51		
	No Response	3 8	17	1 9	2		
101.	CAN YOU SEE FAR ENOUGH AHEAD ON 2-LANE RURAL HIGHWAYS TO TAKE THE CURVES AND STAY SAFELY ON THE ROAD?						
	MOST OF THE TIME	89 0	397	91 3	95		
	SOMETIMES	6 5	20	5 8	6		
	SELDOM	1 1	6	1 0	1		
	NEVER	1 6	7	0	0		
	No Response	3 8	17	1 9	2		
102.	ON YOUR LAST LONG TRIP (1000 MILES OR MORE) ALONG UNFAMILIAR HIGHWAYS, HOW MANY TIMES DID YOU MISS A SIGN (DESTINATION OR ROUTE GUIDANCE) AND TAKE A WRONG TURN?						
	NEVER	23 3	104	31 7	33		
	1 - 2 TIMES	48 0	214	50 0	62		
	3 - 5 TIMES	7 2	32	6 7	7		
	6 - 5 TIMES	2	1	1 0	1		
	6 TIMES OR MORE	1 3	6	0	0		
	No Response	20 0	89	10 6	11		
103	HOW MANY TICKETS HAVE YOU RECEIVED IN THE PAST TWO YEARS FOR MOVING TRAFFIC VIOLATIONS?						
	ONE	5 8	26	11 5	12	6 4	< 05
	TWO	7	3	1 9	2		
	THREE	0	0	1 0	1		
	FOUR OR MORE	4	2	0	0		
	NONE (SKIP TO QUESTION 105)	90 4	402	81 7	85		
	No Response	2 7	12	3 8	4		
104	WHAT WERE YOUR VIOLATIONS FOR? (YOU MAY CHECK MORE THAN ONE)						
	FAILURE TO YIELD	1 6	7	1 0	1		
	GOING TOO SLOWLY		4	2 0	0		
	NOT HEEDING TRAFFIC LIGHTS		9	4 1 9	2		
	NOT HEEDING TRAFFIC SIGNS		4	2 0	0		
	IMPROPER PASSING		9	4 0	0		
	IMPROPER TURNING		9	4 1 9	2		
	RECKLESS DRIVING		2	1 0	0		
	SPEEDING	1 3	6	10 6	11	21 0	< 001
	TAILGATING		4	2 0	0		
	OTHER: _____ (DESCRIBE)	2 9	13	1 9	2		
105	HOW MANY TIMES HAVE YOU BEEN ARRESTED FOR DRIVING WHILE INTOXICATED (DWI)?						
	NEVER	96 2	429	96 2	100		
	ONE	4	2	1 9	2		
	TWO	2	1	0	0		
	THREE	0	0	0	0		
	FOUR OR MORE	0	0	0	0		
	No Response	3 1	14	1 9	2		
106.	HOW MANY ACCIDENTS HAVE YOU BEEN INVOLVED IN AS THE DRIVER OF AN AUTOMOBILE WITHIN THE PAST TWO YEARS?						
	NONE (SKIP TO QUESTION 111)	86 5	386	75 8	82		
	ONE	11 2	50	19 2	20		
	TWO	7	3	0	0		
	THREE	2	1	0	0		
	FOUR OR MORE	0	0	0	0		
	No Response	1 3	6	1 9	2		
107.	IN DOLLAR AMOUNTS, HOW MUCH DAMAGE WAS DONE TO YOUR CAR IN THE MOST EXPENSIVE OF THESE ACCIDENTS?						
	$ 0 - 200	9 4	42	6 7	7		
	$ 201 - 500	2 9	13	4 8	5		
	$ 501 - 750	2 6	11	4 8	5		
	$ 751 - 1000	9	4	3 8	4		
	$ 1001 OR MORE	3 4	15	4 8	5		
	No Response	80 9	361	75 0	78		
108.	HOW WERE YOU INVOLVED IN THESE ACCIDENTS AS THE DRIVER? (YOU MAY CHECK MORE THAN ONE)						
	WAS HIT BY A MOVING VEHICLE	8 1	36	15 4	16		
	HIT A PEDESTRIAN	0	0	0	0		
	HIT A MOVING VEHICLE	2 2	10	1 9	2		
	HIT A STATIONARY OBJECT	2 2	10	2 9	3		
	RAN OFF THE ROAD	9	4	0	0		
	OTHER: _____ (DESCRIBE)	2 5	11	3 8	4		
109.	WERE YOU WEARING YOUR SEATBELT DURING THIS ACCIDENT?						
	YES	7 4	33	14 4	15		
	NO	8 3	37	8 7	9		
	No Response	84 3	376	76 9	80		
110.	AS A RESULT OF THIS ACCIDENT, DID YOU OR A PASSENGER IN YOUR CAR RECEIVE MEDICAL TREATMENT? (YOU MAY CHECK MORE THAN ONE)						
	YES, I RECEIVED TREATMENT	1 3	6	1 9	2		
	YES, A PASSENGER IN MY CAR RECEIVED TREATMENT	2	1	0	0		
	NO ONE RECEIVED TREATMENT	14 6	66	22 1	23		
111.	HOW FAST DO YOU USUALLY DRIVE IN COMPARISON WITH THE GENERAL FLOW OF TRAFFIC?						
	MUCH FASTER	2	1	0	0	9 6	< 01
	SOMEWHAT FASTER	6 3	28	14 4	16		
	ABOUT THE SAME	76 7	342	77 9	81		
	SOMEWHAT SLOWER	12 1	54	5 8	6		
	MUCH SLOWER	0	0	0	0		
	No Response	4 7	21	1 9	2		
112.	HOW DO YOU USUALLY CHECK TO THE REAR? (YOU MAY CHECK MORE THAN ONE)						
	USE DRIVER OUTSIDE VIEW MIRROR	84 1	376	80 8	84	4 3	< 05
	USE DRIVER INSIDE VIEW MIRROR	91 5	408	94 2	98		
	TURN AND LOOK BACK	46 1	201	56.7	59		
	RARELY CHECK TO THE REAR	1 3	6	0	0		
	OTHER: _____ (DESCRIBE)	1 8	7	2 9	3		
113.	WHEN DRIVING DURING THE DAY, HOW OFTEN DO YOU PASS OTHER CARS?						
	FREQUENTLY	10.1	46	24 8	26	19 1	< 001
	SOMETIMES	64.3	287	61 5	66		
	SELDOM	22 6	101	11 3	12		
	NEVER	1 6	7	0	0		
	No Response	1 3	6	1 8	1		

114. How often do you find yourself failing to see signs and other road ma...ers?	Frequently	9	4	0	0	8 9	< 05
	Sometimes	18 6	83	7 7	8		
	Seldom	63 8	285	76 6	79		
	Never	16 1	72	15 4	16		
	No Response	9	4	1 8	1		
115. Do you have fender scrapes, door gouges or dents on your car that are a result of your driving?	Quite a lot	2	1	0	0		
	Just a few	9 4	42	5 8	6		
	None	88 8	398	93 3	97		
	No response	1 6	7	1 0	1		
116. In comparison to yourself two years ago, how is your ability to steer the automobile?	Much better	2 5	11	4 8	5	18 7	< 001
	Better	3 4	15	10 6	11		
	About the same	92 4	412	83 7	87		
	Worse	2	1	0	0		
	Much worse	0	0	0	0		
	No Response	1 6	7	1 0	1		
117. In comparison to yourself two years ago, how is your reaction time in braking?	Much better	2 5	11	1 9	2	6 9	< 01
	Better	3 4	15	11 5	12		
	About the same	90 8	405	86 6	89		
	Worse	1.8	8	0	0		
	Much worse	0	0	0	0		
	No Response	1.6	7	1 0	1		
118. In comparison to yourself five years ago, are you a:	Better driver	17 7	79	51 0	53	50 9	< 001
	About the same	73 0	348	47 1	49		
	Worse driver	2 7	12	1 0	1		
	No Response	1 6	7	1 0	1		
119. Five years from now, do you believe you will be a:	Better driver	6 5	29	23 1	24	35 9	< 001
	About the same	72.6	324	74.8	77		
	Worse driver	15 7	70	1 9	2		
	No Response	6 2	23	1 0	1		
120. At about what age do you estimate you would no longer wish to drive an automobile?	55 - 59 years	2	1	2 9	3	49 0	< 001
	60 - 64 years	1	5	1 8	2		
	65 - 69 years	1	3	1 4	4		
	70 - 74 years	4 7	21	15 4	16		
	75 - 79 years	11 4	51	19 2	20		
	80 - 84 years	26 9	120	23.1	24		
	85 - 89 years	20 4	91	3 8	4		
	90 years or more	19.8	87	15 4	18		
	Comment: _____ (describe)	12 3	56	12 5	13		
	No Response	3.4	15	1 9	2		
121. At about what age do you estimate you would no longer be able to drive an automobile safely?	55 - 59 years	2	1	1 0	1	54 0	<.001
	60 - 64 years	0	0	0	0		
	65 - 69 years	3	1	3 8	4		
	70 - 74 years	2 7	12	12 4	15		
	75 - 79 years	9 2	41	19 2	20		
	80 - 84 years	26 2	117	25 0	26		
	85 - 89 years	24 2	108	12 5	13		
	90 years or more	19 7	88	9 6	10		
	Comment: _____ (describe)	11 9	53	8 7	9		
	No Response	5 6	25	5 8	6		
122. Who should make the decision about when it is time to give up driving? (you may check more than one)	Driver himself/herself	74 9	334	73 1	76		
	Family member(s)	32 3	144	29 8	31		
	Doctor (s)	84 3	242	83 5	86		
	Motor vehicle license dept.	33 9	151	52 9	55	12 8	< 001
	Police dept.	6 5	29	23 1	24	26 4	< 001
	Other: _____ (describe)	1 6	7	2 9	3		
123. Is age alone a good basis for determining when it is time to give up driving?	Yes (SKIP to question 125)	8 3	37	3 8	4		
	No	88 6	395	96 2	100		
	No Response	9 1	14				
124. If not, what other things should be considered? (you may check more than one)	Driver's health	87 0	388	92 3	96	6 1	<.05
	Accident record	80 6	306	82 7	86		
	Need for mobility	23 5	105	27 9	29		
	Other available transportation	13 0	58	10 3	19		
	Comment: _____ (describe)	7	3	10 6	11		
	No Response			1 9	2		
125. Do you think a driver's license is a privilege or a right granted to all qualified individuals?	It is a right	22 2	99	12 5	13		
	It is a privilege	72 2	322	79 8	83		
	I don't care which	3 4	15	4 5	5		
	Comment: _____ (describe)	.4	2	1 0	1		
	No Response			1 9	2		
126 At what age do you think older drivers should be required to renew their licenses through reexamination?	No specific age requirement (same reexamination requirements as for younger drivers)	37 7	168	26 0	27	81 2	< 001
	55 - 59 years	1 8	8	8 7	9		
	60 - 64 years	3 6	16	19 2	20		
	65 - 69 years	8 5	38	24 0	25		
	70 - 74 years	14 8	66	10 6	11		
	75 - 79 years	11 2	50	1 9	2		
	80 - 84 years	9 2	42	1 0	1		
	85 - 89 years	4 0	18	1 9	2		
	90 years or more	4 7	21	5 8	6		
	Comment: _____ (describe)	0	0	0	0		
	No Response	4 3	19	1 0	1		
127. What kind of periodic driver reexamination would you favor for older drivers? (you may check more than one)	Eye test	76 6	337	73 3	74		
	Total physical examination	21 3	95	16 3	17		
	Written test	30 7	137	41 3	43	4 0	< 05
	Driving (demo) test	50 9	227	64 4	67	5 7	< 05
	All of the above	14 6	65	26.9	28	8 8	< 01
	None of the above	2 7	12	3 8	4		
	Comment: _____ (describe)	2 7	12	8 7	9		
128. Would periodic reexamination make you feel nervous or threatened?	Yes	30 5	136	27.9	29		
	No	61.9	276	64 4	67		
	Comment: _____ (describe)	3 8	17	4.8	5		
	No Response	3.8	17	2.9	3		

APPENDIX B:
Survey Sites: Cooperating Personnel and Organizations

Mr. David A. Juvet
Arizona Automobile Association
3144 North Seventh Avenue
Phoenix, Arizona 85013

Ms. Lois Porter
Pinal-Gila Council for Senior Citizens
1130 East Broadway
Apache Junction, Arizona 85220

Mr. Myer N. Nemer
55 Alive/Mature Driving
Driver Improvement Program
10014 Gulf Hills Drive
Sun City, Arizona 85351

Mr. Richard A Swart
Mr. Dennis Rowe
Automobile Club of Southern California
2601 South Figueroa Street
Los Angeles, California 90007

Felicia Mahood Senior Multipurpose Center
11338 Santa Monica Boulevard
West Los Angeles, California 90025

Mr. Robert Talbot
55 Alive/Mature Driving
Driver Improvement Program
2840 South Wheeling Way
Aurora, Colorado 80014

Mr. Robert J. Ouellette
Ms. Linda Chase
Mr. Saverio Urgo
Automobile Club of Hartford
815 Farmington Avenue
West Hartford, Connecticut 06119

Mr. Kevin Bakewell
St. Petersburg Motor Club
1211 First Avenue North
St. Petersburg, Florida 33705

Mr. Edward R. Klamm
Ms. Pat Taylor
North Shore Senior Center
620 Lincoln Avenue
Winnetka, Illinois 60093

Mr. Ladd Shorey
2115 Bahlia Lane
Billings, Montana 59201

Mr. Frank B. Hynes
Mr. Richard Newhouse
Automobile Club of New York
28 East 78th Street
New York, New York 10021

Ms. Penny Fischler
West Hempstead Senior Center
104 Beverly Place
Levittown, New York 11756

Mr. Edmond E. Swiecki
Port Washington Police
500 Port Washington Boulevard
Port Washington, New York 11050

Ms. Joanne Senecal
Glen Cove Office of Senior Services
130 Glen Street
Glen Cove, New York 11542

Ms. Selma K. Levitsky
55 Alive/Mature Driving
Driver Improvement Program
565 West End Avenue
New York, New York 10024

Mr. Gregory M. Teslevich
Mr. Jack Haver
Mr. Ralph N. Stoner, Sr.
West Penn Motor Club
202 Penn Circle West
Pittsburgh, Pennsylvania 15206

Mr. Peter Gregor
55 Alive/Mature Driving
Driver Improvement Program
Box 640
Winner, South Dakota 57580

Mr. Paul S. Curtis
AAA Texas
3000 Southwest Freeway
Houston, Texas 77098

Dr. R. Othal Feather
P. O. Box 5661
San Angelo, Texas 76902

Mr. E. W. Timmons
Tidewater Automobile Association
739 Boush Street
Norfolk, Virginia 23510

Pioneer Kiwanis Club
Norfolk, Virginia

Ms. Robyn Friedman
Norfolk Senior Center
924 West 21st Street
Norfolk, Virginia 23517

Mr. Edward B. Fisher
Mr. Bruce Olson
Ms. Tracy
Automobile Club of Washington
330 Sixth Avenue North
Seattle, Washington 98109

Mr. Francis J. Eckerman
AAA Wisconsin
433 West Washington Avenue
Madison, Wisconsin 53701

Mr. George M. Richard
Milwaukee Safety Commission
841 North Broadway
Milwaukee, Wisconsin 53202

Ms. Doraine M. Schindler
Washington Senior Center
4420 West Vliet Street
Milwaukee, Wisconsin 53208

Mr. Gene Campbell
Beulah Brinton Community Center
2555 South Bay Street
Milwaukee, Wisconsin 53207

Mr. Michael Seaton
55 Alive/Mature Driving
Driver Improvement Program
American Association of Retired Persons
1909 K Street, N.W.
Washington, D.C. 20032

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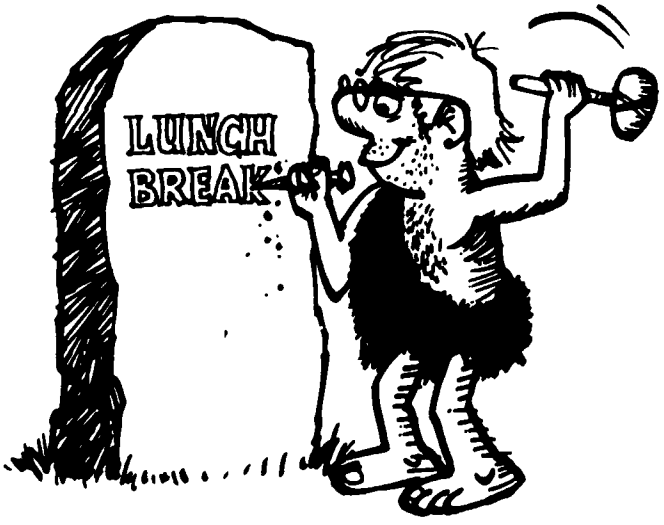
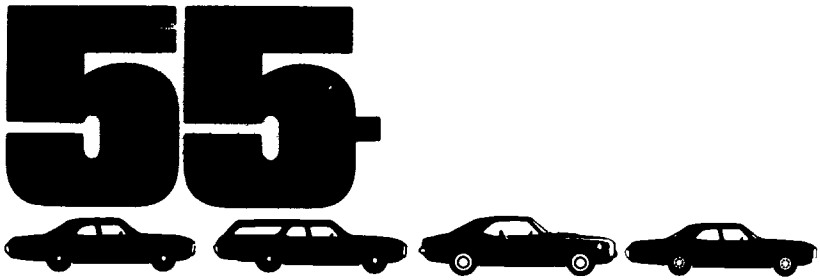
Amos E. Neyhart, Colloquium Recorder



Amos E. Neyhart, Director Emeritus, Institute of Public Safety, Penn State University, and Driver Education Consultant, American Automobile Association, received a B.S. in Industrial Engineering and an M.S. in Applied Psychology from Penn State ('21 and '34) and was designated Distinguished Graduate in '66. Professor Neyhart is best known as "America's Pioneer in Driver Education," having presented the first high school courses, in 1933, first teacher-preparation course, in '36, and the first college professor's seminar in '37. For the past seventeen years, he has offered college courses for high school teachers on "Effect of Alcohol and Other Drugs on the Driving Task". He has conducted courses in driving for the American Red Cross, Civil Defense, and U.S. Armed Forces, among others. Professor Neyhart has been Executive Director of the Governor's Traffic Safety Council of Pennsylvania and Chairman of Education of the President's Committee for Traffic Safety. In 1956 he received The Meritorious Medal, the highest civilian award of the State of Pennsylvania. In 1961, he was Technical Advisor on Transportation to the Republic of Yugoslavia, and in 1973 conducted a course for the police in Guyana. For the past five years he has been president of The State College Area Senior Citizens Club and in '85 will be president of The Penn State Retired Faculty organization.



Editor's Comments

James L. Malfetti

James L. Mafetti, Ed.D., is Professor of Education and Director of the Safety Research and Education Project at Teachers College, Columbia University. He has served as consultant to national, state and local organizations in the development of traffic safety programs, and has written preventive and rehabilitative programs for people of all ages—five to fifty-five plus—on alcohol and traffic safety. On sabbatical leave in 1984-85 as an Associate Fellow of the Andrew Norman Institute for Advanced Study in Gerontology and Geriatrics, Ethel Percy Andrus Gerontology Center of the University of Southern California, Dr. Malfetti worked on a self-assessment inventory for older drivers.

A lot of good thoughts that are given voice at meetings (or at the activities which precede them) never quite make it to the final report. This colloquium was no exception, and there are a few of the things said that seem worthy of mention here.

1. The survey results reported in Dr. Yee's paper show 75 years as the age at which older drivers choose responses that suggest the beginning of a higher risk period for them as well as a greater willingness by them to the need to be reexamined for the driving license. Panel members could find no justification for compulsory reexamination at *any* age, based on age alone, but age 75 seems among the most reasonable of any proposed. Allowing for the usual lead time required for getting older people "tuned in" to what is going to happen to them, 65 would be a good age for introducing information about licensing action to occur 10 years in the future, and the reasons for those actions. It would be a good age at which to gain understanding of and cooperation in events to come, as opposed to resentment of "others suddenly thrusting things upon us."

2. Gerontological literature supports the positive relationship between "bonding" and the good mental health of older persons. Belonging to some person or group or activity is very important to them. Senior adults should join in, or serve as volunteers, in community social service and health care agencies. In turn, the local senior service agencies, perhaps supported by parent affiliates (where they exist), should sponsor workshops, seminars, or other activities in health, transportation (i.e., maintaining one's license and equitable insurance coverage), and other vital matters.

Activities to promote physical and mental health should receive priority. A healthy body will have the skills demanded for safe driving, and good mental health helps to lower the hostility that some believe contributes to the types of driver interaction that result in accidents. In combination, both mental and physical health fit positively

into the well documented precept "Man drives as he lives." Thereby they serve all road users.

3. In view of the current and projected increase in the number of older drivers, state licensing agencies should establish special sections for dealing with drivers over 65 years of age, or, if numbers do not warrant this, should assign personnel in existing sections. Those so assigned should be trained in the motivational and learning characteristics of older adults, and sensitive to their needs and problems.

A deliberate effort might well be made to determine whether older adults who fail written licensing examinations are doing so because of a lack of knowledge of the answers, or because they are being stymied by the layout of the test. If the latter, practice in taking such tests, before taking the one that counts, might be suitable; or the formats might be appropriately altered.

On road tests older applicants may respond slowly or improperly to commands (perhaps because the commands are not pronounced clearly or slowly enough) and thus fail the examination. Sometimes widows must learn to be drivers at an advanced age and are nervous about operating in a car with a male as passenger and examiner. Special reassurance may be needed for fair assessment of capabilities. If the examinee feels totally out of control about what is going on and why, the perceived loss of control can produce stress and a worsening of performance.

The need for the license and the circumstances under which it will be used may warrant exploration. Some older applicants may not be fully qualified for driving under all conditions, but be capable of driving between specific places for specific reasons. They could be issued a restricted license with clear delineation of the restrictions.

4. Social learning theory suggests that when people understand the reason some restrictive action must be taken against them, and are told the specific steps by which they might be able to overcome the restriction, they are more willing to accept it than if it is imposed by an external authority. The license of an older driver might be essential to his/her independence and well-being. Every opportunity should be taken to insure that the older driver is made aware of impairments, and of what action can be taken to overcome them. When a person thinks he or she can do something about an impairment, that person is more likely to try to do something about it.

Toward this end, a valid and reliable self-assessment inventory should be created so that older drivers can evaluate their own performance. Self-assessment is less threatening, creates less defensiveness and denial, and opens the way for a realistic appraisal of driving skills. The inventory should be short and should incorporate what is known of the learning and motivational characteristics of older adults. Scores should be tied to explanations of what they mean and to what can be done by the driver to cope with the shortcomings revealed. While the emphasis of the inventory and related scores and explanations would be on keeping older drivers on the road as long as they can perform with safety for themselves and others, the inventory should also give clues of when it is time to turn in one's license, or to expect to have it rescinded by authorities. If this latter event becomes necessary, issuing a "license identification card" would give the licensee added incentive for compliance.

The inventory should be widely disseminated and put to use through older driver retraining courses, motor vehicle agencies and senior citizen centers, as a motivator for self-regulation.

5. Burton Marsh, who in 1960 wrote a classic paper on the older driver, reflected one evening during the colloquium that nothing much had been done to improve things in 25 years. He felt that part of the reason for this was the lack of a continuing organization to bring together the many disciplines involved in the needs and

problems of older drivers. The organization could be housed as a separate entity in an existing traffic safety or gerontological organization of national scope and influence. It could serve as a center for the dissemination of research findings; it could plac recommendations before persons in government and private organizations in a position to act on them. Above all, it could get the word out to older drivers on what others are planning for them, so that they could "get in on the action"—enlisting the elderly to work on their own behalf.

6. Finally, as findings relevant for the traffic safety of older adults emerge from national dialogue, they should not be disseminated only to that age group. Both the capabilities and limitations of older drivers should be presented to younger drivers through educational and public information channels. This might help young people to know more fully what to expect of their seniors, and thus produce a more reasoned and safer interaction with them in traffic, as well as begin to prepare the younger group for its own future on the road.